The Dental Digest.

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Original Contributions.

ELECTRICITY—WHY IT SHOULD BE TAUGHT IN DENTAL COLLEGES, AND HOW.

BY WESTON A. PRICE, D. D. S., CLEVELAND. READ BEFORE THE INSTITUTE OF DENTAL PEDAGOGICS, AT CHICAGO, DEC. 29-31, 1902.

Let us approach this subject with a few simple deductions. Why do we have dental colleges? To equip men and women to properly practice dentistry. Why do we practice dentistry? To serve humanity. What should we teach in dental colleges? That which will equip men and women to best serve humanity. You will all give hearty assent to these simple deductions and grant that they are good logic, but I am now going to make a statement with which many of you will not agree. Before doing so I wish to remind you that teachers are consistent thinkers, and that as such you have that important fundamental virtue of being able to withhold judgment and weigh without prejudice the arguments on their merits. I do not make this statement to arouse discussion, but to bring out what to me is a fact, and possibly I have some right to strong convictions on this subject. It is this—*There is to-day no one subject taught in our dental colleges that will enter so largely and frequently into the best possible service that we as dentists can render as electricity.*

There are scores of electrical processes and devices that excel all others of which the profession generally is ignorant, and but few could use same intelligently because of their lack of the necessary electrical knowledge. One of the most rapid ways of presenting the evidence to sustain the above assertion is to take you to the busy office and there observe in detail the application of our fund of dental knowledge in the rendering of the best possible service to our patients in a day's work in actual practice.

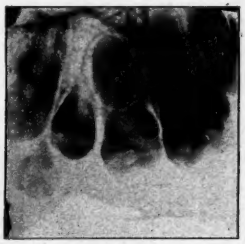
The first patient we find in the office on arriving in the morning is Miss S., age sixteen. She had no appointment, but is suffering intensely from a toothache, as she calls it. Now let us see what subjects taught us in the dental college will help most in rendering her the best possible service. What are the symptoms? Chiefly pain, several teeth tender to touch, each with large fillings, no definite history, no swelling, no special difference in their response to thermal changes. What is the best service we can render that patient? Certainly it is to relieve the pain as soon as possible, and do it by removing the cause. The question in hand is diagnosis. Try Materia Medica, what assistance will it offer? Practically nothing in this case. Anatomy will certainly help in the diagnosis. Bacteriology offers nothing. Pathology makes essential suggestions, which are, that probably it is either pulpitis, or pericementitis from

No. 1.

a dead pulp, or a faulty root filling. Chemistry offers nothing; Prosthesis, nothing; Dental Jurisprudence, nothing; Histology, nothing; Electricity, several excellent things. That which will help us most is to establish quickly whether or not the pulp is dead in any of these teeth. Thermal changes gave indefinite results. Nothing will tell you so quickly and truthfully and painlessly as an electric current. Transillumination with electric light may show the root fillings, but we have a surer method. Quickly dry the fillings and place a cottonoid pad against the cheek, touch a filling in one of the teeth with an electrode attached to the cataphoric outfit, and carefully turn on the current until the patient feels a slight sensation like warmth or cold, not pain, and note the amount of current indicated by the milammeter—.05. Test another tooth—.07; test another —.9. You have it almost to a certainty that this first permanent

molar is dead. It takes eighteen times as much current as the first tooth tested. What is the history—is this tooth dead, and are its roots filled? Patient does not know, neither does the dentist. Ask your Anatomy, it cannot tell you; ask Materia Medica, nothing; Bacteriology, nothing; Pathology, nothing; Prosthesis, nothing; Chemistry, nothing; Dental Jurisprudence, nothing; Histology, nothing. Here is where you will have to stop and use counter-irritation to cover your ignorance, for which you no longer have an excuse, or ask Electricity—it alone can tell you. Just a one-to-

No. 5—*a*.



No. 5—*b*.

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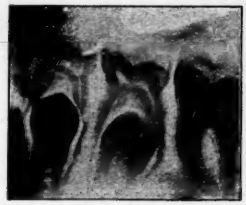


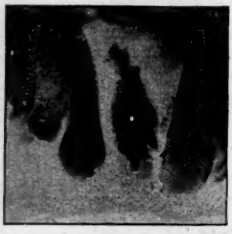
No. 5—*d*.

three-seconds exposure from the ever-ready X-ray machine, and twenty or thirty seconds more to develop the bromid paper enclosed with the film, and you have all the information before you to study in detail. See case No. 1. There is a splendid root filling in the palatal root, and also in the disto-buccal root, but the mesio-buccal root has been drilled through and filled through its side, and has a large area of absorption about its apex, extending forward to the second bicuspid. Thus you know the whole story in a few moments, better than you could by all other means at your disposal

combined for any possible length of time. Let me ask just here how many of you do it in that way, and if not, why not? But some time when you have more leisure, think out the whole history of that case without this exact information.

The diagnosis is perfect, now for the treatment. See picture No. 1. The relief of the pain is now simple because we know it is due to pressure from confined suppuration, the location of which is ascertained. You may drill through the filling with a steady running and quiet electric engine, the best available kind by far, and open only the mesial root, dissolve out the root filling, and give relief, which you would probably do if you knew only that the trouble was in this root without knowing that you would leave the irritant still in the tissue beyond the root. Knowing the exact condition you would

No. 6.



No. 7.

No. 8.

better open through the process at once, through which opening you will later amputate the apex of the root. Most of the patient's pain was relieved by the sedative effect of the X-rays. With removal of the pressure the relief is soon complete. You have been able to do exactly the right and best thing for the patient, and it has taken fifteen minutes altogether.

Suppose you should decide to induce absorption of the pus, how could you best relieve the pain? Vigorous counter-irritation may do this in time. For this you must summon to this part an extra number of the white blood corpuscles, for which iodin has special properties. How much is absorbed by simply painting it on the surface compared to applying the negative pole of your cataphoric apparatus to it and carrying it in by electrolysis? There is certainly no comparison in the efficiency of these two methods, yet how many do it in that way, and why? But suppose the pain still continues,

what more can you do? Will you send the patient away with a sweet promise? No. The pain in almost any condition can be relieved by the positive pole of a galvanic or static current. Dr. William Rollins of Boston uses the latter very extensively.

The next patient, Mr. B., a busy man of thirty years, who had the first appointment, does not regret seriously the loss of ten or fifteen minutes, and we proceed. He has been too busy to go to the dentist before, and he dreaded the ordeal so much, but Nature's monitor sounded the note of warning and he reluctantly heeded. We find he has several very sensitive cavities. For making a thorough examination we use an electric illuminating device, which makes every corner as light as day, but no glare reaches the operator's eyes. What is the best possible service we as dentists can render this

No. 9—*a*.

No. 9—*b*.

No. 9—*c*.

patient? Certainly it is to give him the best possible fillings with the minimum of pain and discomfort. It is a cold morning, so you turn on the electric footwarmer (if it were a hot summer's day, the electric fan), for he is nervously cold. He is dreading the excavation of that second right superior bicuspid and also the cuspid, for both have large cavities and have troubled him greatly. He also has cavities in the left lateral and cuspid and first bicuspid. The rubber cloth is punched for all these, but is put over only the right bicuspids and cuspid, and the second bicuspid is dried carefully with a steady mild stream of warm air, just blood heat, from an electrically heated compressed air syringe. Since one of the simplest anesthetics we have is warm air, we slip over the handpiece a nozzle conveying it, so that a stream of warm air is delivered directly into the cavity onto the bur, thus dispersing the chips as they are cut.

This device has a double advantage, for the source of heat is also a source of light which is reflected directly into the cavity, but not visible to the eye.

Presently we reach very sensitive dentin, which however must be removed for the proper formation of the cavity. We must anesthetize that cavity if we are to render him the best possible service, and we must not produce pain in doing so. Let us go over our college curriculum again for a painless remedy. Anatomy has none, Materia Medica will help us locally but is not satisfactory either in thoroughness or freedom from pain in application. Bacteriology cannot help us, nor Pathology, nor Physiology, nor Prosthesis, nor Chemistry, nor Dental Jurisprudence, nor Histology. Here is where ninety-nine out of every hundred dentists fall down and acknowledge

No. 13.

No. 16.

No. 17.

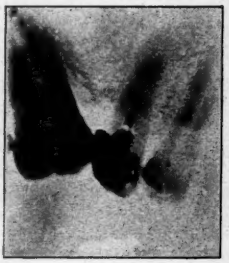
their inability to render the best possible service, by causing the patient to submit to the ordeal they would go to any trouble themselves to escape. But thanks to the last years of the Nineteenth century and first of the Twentieth the dental profession has to-day a means for thoroughly and painlessly desensitizing these sensitive teeth without loss of time on the whole to either the patient or dentist, but with a decided saving of time to both if properly used. Cataphoresis properly applied is a veritable Godsend to both the patient and dentist, for with it the latter as well as the former is relieved of nine-tenths of his nervous strain. We make the application in the sensitive bicuspid, and it takes only one or two minutes to insulate the cavity and start the application, which takes from ten to thirty minutes, usually not more than fifteen or twenty minutes. While this is going on, and entirely painlessly, we proceed to open up the

large distal cavity in the adjoining cuspid. We know just how anesthesia is progressing by the milammeter, which also tells whether the insulation is perfect or not. We do not find this cuspid cavity very sensitive, but after removing the debris and decay we discover a large exposure of the pulp, not freshly made. This pulp must be removed and the root filled. To the patient this is one of the most dreaded operations, and rightly so. He does not know it is exposed, though he is fearful that something is serious in that tooth, for it has troubled him greatly. We adjust the dam on the anterior teeth, exposing more cavities which we open up, meanwhile frequently increasing the current on the right bicuspid, but never producing any pain by so doing.

By the time we have opened up these cavities the bicuspid is

No. 18.

No. 20.



No. 21.

anesthetized, and we change the flexible electrode with cocain solution from it to the cuspid, and proceed to excavate the bicuspid absolutely without pain and while anesthetizing the cuspid. Having prepared this cavity to our liking, which takes only three or four minutes or less when the tooth is thoroughly desensitized, to prevent the conduction of thermal changes we insert an insulation, cement or other material, over the floor of the deeper part of the cavity, where, by the way, we rarely have to do much drilling beyond the removal of decay, and insert a large compound filling of gold, finishing off with gold and platinum. These are annealed in an electrically heated annealer, because it is far superior to any other kind. By the time this gold and platinum filling is completed, and in fact long before, the cuspid pulp is entirely desensitized, but it will do no harm to allow the current to run until we are ready, provided the cotton

does not get dry or we use too much current, thereby setting up an irritation about the tooth, but the latter is impossible because of our milammeter. We remove this cuspid pulp on a broach, but before doing so shift the cataphoric application to the four approximal cavities in the left lateral, cuspid, and first bicuspid. The patient knows nothing of the pulp having been removed, unless we choose to show him to establish his confidence that we can work without hurting him.

If there were any possible doubt of the entire pulp being removed we would not fill at once, but being certain that it is, we proceed to prepare the root for filling. Its position is a hard one to see into,

No. 22.

being a distal cavity, so we adapt a simple electric illuminating device which is not in the least in our way while working, nor is its source of light directly visible to the eye. With this we can continually see the pulp chambers and canals in any posterior tooth quite as plainly as we can a well exposed anterior canal. This next step is where from fifty to seventy-five per cent of our root fillings fail. We do not thoroughly dry, sterilize, and fill the roots. I know what I am talking about, for I have X-ray pictures of nearly a thousand of all grades, good, bad, and awfully bad—alas, mostly the last two kinds. We must dry the tooth thoroughly to the apex, which can best be done with an electrically heated root-canal dryer. By the time this canal is properly filled the other cavities are ready

to excavate, but certainly they would have different resistance and hence would not all be perfectly anesthetized at the same time, so we will permit the application to remain until we have filled the cuspid. This being done, we quickly and painlessly prepare all four of these cavities and insert temporary stopping, properly warmed in an electric gutta-percha warmer, because it is the best. These we leave until the next sitting, at which time we insert these four gold fillings while electrically anesthetizing four more cavities in the bicuspids and molars. The total extra time consumed in making the cataphoric application to all these teeth did not exceed ten minutes, and you can judge the amount of time actually saved in excavating them.

I have not been painting an ideal picture but a case from prac-

No. 23.

No. 24.

tice during the past week. The patient entered the chair with such dread and fear that the perspiration stood out on his forehead, but after all the work recorded above, namely, the preparation of six very sensitive cavities without the least pain, the removal of one exposed pulp, the insertion of a root-filling and two large fillings, he wanted to know why I did not go ahead and finish all the teeth, that he was perfectly willing, but I had to tell him his time was more than up. I need not dwell upon his extreme gratitude, you know human nature well enough to judge of that. You could hardly put a money value upon it.

The next patient, Mrs. M., aged forty, calls for the treatment of pyorrhea. This condition had been recognized years ago, but she had been assured that nothing could be done to better it. How can we best serve this patient? Going over our college curriculum

again we find exceedingly little assistance. Materia Medica and Pathology can help us a little, but we finally go to work and remove the deposit from every surface of those teeth, and though we apply agents to the tissues, the mechanical cleaning of the surface is nine-tenths of the good we accomplish. Now here is where electricity comes in to assist when all else fails. True, the deposit must be removed, but the combination electrically heated stream of compressed air and powerful illuminating device will aid us greatly in this, but when we have mechanically cleaned the surface of the teeth we have only gotten ready to treat the disease. How can we restore the tissues involved to their normal functions? Materia Medica, nor any nor all of our college courses can do it. In my hands no treatment has been so successful as the X-rays and elec-

No. 25.

No. 26.

No. 27.

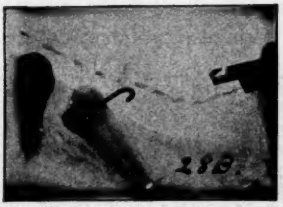
trolysis. For the latter I use electrodes made of tin, copper and zinc, in a solution of trichloracetic acid in the pockets. The tone of the tissue is improved at once and the results are more permanent and satisfactory than by any other method I have seen. The presence of pain is removed after the first or second application, and if the treatment is occasionally followed up I find little or no tendency to recurrence.

A new light has dawned upon the sufferers from this disease, of which it is too early to say that it will positively cure. Some of you may not know that cancer, sarcoma, carcinoma, lupus, and practically all malignant growths which are a diverted form of cell proliferation, are benefitted and many are apparently entirely cured by proper treatment with the X-rays. On the hypothesis that pyorrhea so-called is an allied condition of diverted cellular function,

I treated some cases experimentally. It is too soon to say positively about a cure, though I have many cases which are exceedingly encouraging, and I have more faith in it to-day than any other treatment. My first case was about three years ago, and as yet there has been no recurrence. I have a number of cases where there has been cessation of pus after two or three applications. There is great reason for hope from this treatment, but I say frankly it is too complicated and exacting for the untutored profession of to-day to hope to apply successfully without study.

After luncheon our first patient is Miss M., who made an appoint-

No. 28—*a*.



No. 28—*b*.

No. 28—*c*.

No. 28—*d*.

ment by mail. She has come from a neighboring town to have a broken lateral crowned, and she must have the new one in place to return. The pulp is alive, and on removing the remnants of the gold fillings we find the tooth structure extremely dense and very sensitive. The pulp must be removed at once, and painlessly, as the patient is not physically able to endure pain, though willing if necessary. Can the graduate of any dental college in the world to-day give her the best possible service without electricity? The pressure method will not serve, as the dentin is too dense, but with cataphore-

sis in from twenty to thirty minutes the pulp is entirely removed and without a particle of pain. You have gotten everything ready in the meantime for making a porcelain crown over a platinum post and jacket. Again you come to electricity for the ideal oven which makes it possible for the crown to be built up, baked and artistically stained to match the more worn incisors. The patient leaves the office with the new crown in place, a work of art, for it is the concealment of art, just an hour and a half after entering—an accomplishment absolutely impossible without electricity. This also is a case from actual practice within the last ten days.

The next patient is a boy, fifteen years of age, who presents for correction of the malposition of his teeth. He has an intruded superior bite, the deciduous molars are still in the arch, as is also the deciduous cuspid. Why have not the permanent teeth erupted? where are they? and did they ever form? are questions that must be answered. You cannot safely move one step toward the correction of this condition until you know. Ask Anatomy and it replies yes, precedent says they are there, but just a little delayed. Too indefinite. Ask your whole curriculum, and you get absolutely no assistance. Roll round the ever-ready X-ray table and take a peep with the mouth fluoroscope, or, better yet, quickly make a couple of exposures each from one to three seconds, and in less than two minutes you know it all, as you have the bromid paper skiagraph before you to study. Both bicuspids are missing on the right side, see skiagraph No. 5, and both are present on the left, but the roots are not more than half formed. One left superior bicuspid is missing. The permanent cuspids are both formed, but the right one is malposed, its apex being directed toward the lateral. There is as much superiority in your ability now over what it was before to render good services to that patient as daylight is better than darkness. This a typical case from practice.

The next patient is an elderly lady suffering from chronic neuralgia. Symptoms typical of an obscure irritant. Where and what is it? The best possible service to the patient will find it. Don't treat indefinitely in a process of exclusion, but find that irritant. The teeth are apparently normal, though none is firm. Try transillumination for detecting the presence of pus in the antrum. Note that absolutely no light but electric will do for this. Place the ten-candle-power low-heating lamp into the mouth in the darkened room

and you get a definite shadow under the right orbit. It is exceedingly suggestive. You ask, What is the cause of that fluid in the antrum? No. 6. Ask your curriculum and you get no answer. Take a skiagraph and you find an abscess from a bicuspid discharging into the antrum. This root has a very imperfect filling. You are now ready to render the best possible service, indeed, you have already rendered it, diagnosis being almost everything in such a case.

The next patient presents for treatment a chronic abscess with a fistula over the crowned lateral. The history is long enough, alas, too long—troubling for five years. Dr. A. wanted to extract, Dr. B. said he had tried in vain to cure it, which was evident. What is the trouble? The profession of yesterday answers, it is an incurable case. But why? What is the condition? Ask your old college

No. 29—*a*.
Age, 14 Months.

No. 29—*b*.
Age, 28 Months.

No. 29—*c*.
Age, 3 years.

professor. Which one? Ask them all. They all shake their heads, so hang up your curriculum again and ask electricity. Take a skiagraph. (See No. 7.) It shows exactly the condition, which is extensive absorption of and about the apex, but the tooth is by no means incurable. Amputate the apex and remove all the diseased portion.

The next patient presents a putrescent pulp and blind abscess, which you will best treat by electrolysis of silver nitrate and other dissolved salts.

Just so I could fill in every hour of each day for a week, with no two cases alike, if time would permit. For example, I would present typical cases of neuralgia from pulp nodules, and their diagnosis with the X-rays. See skiagraph No. 8. Neuralgia from excemento-

sis and its diagnosis with the X-rays. See skiagraph No. 9. Also its treatment with the X-rays, which is proving very helpful and promises to be very successful. The treatment of neuritis and painful neuralgia by raying with the X-rays, giving most satisfactory relief from the pain. Treating erythema, lupus, rodent ulcer, and cancer about the mouth with X-rays, with relief of all itching and apparent cure. Relieving the pain of acute abscess by exposing to the X-rays. The detection of decay beneath fillings with the X-rays. Nos. 1, 6 and 13. The detection and location of typical pericemental abscesses where the pulps are alive. The cure with X-rays of chronic abscess with fistula, where tone of tissue is abnormal even after the irritant is removed. The locating of galvanic currents from fillings, producing neuralgia and pulpitis. Showing the cause of resorption of roots of permanent teeth by unerupted teeth. Nos. 16 and 17. Faulty root fillings that pass beyond the apex. No. 18. Broken drills and broaches in teeth. Nos. 20 and 21. Diagnosing tumors which contain teeth. Nos. 22 and 23. Inlocked bicuspid. No. 24. Resorption of implanted root. No. 25. Impacted third molars. No. 26. Fractured roots. No. 27. Malposition and regulation before eruption. No. 28, a, b, c, d. Studying tooth development. No. 29, a, b, c. Cases of impacted missing cuspids. No. 30, a, b, c, d. I have hardly time to open the door to this vast subject, which is almost a new science sweeping into the practice of dentistry.

Perhaps you say cataphoresis is a failure, or is more trouble than it is worth—the X-ray pictures speak for themselves, but you give us only your word for the efficiency of cataphoresis. What are the facts? Cataphoresis came before the members of the profession were capable of correcting or even detecting the causes of their failures, which were primarily due to absolutely inefficient apparatus, and secondarily to inability to fulfill the requirements of the laws of the forces with which they were dealing and the conditions under which they were using them. To-day the apparatus has been so perfected that the first named difficulty has been entirely overcome, and all that is needed now is intelligent application. Naturally and rightly you demand proof for this statement. To-day there are over thirty of the leading dentists of Cleveland using it successfully. Their carefully expressed opinion is of great value at this time. In response to the question, "Does cataphoresis in your opinion enable

the dentist to render materially better service to his patients?" I have the following replies: Dr. Spargur, Cleveland, writes: "In my opinion cataphoresis in the hands of intelligent, careful operators is a complete success in nearly every case where its use is indicated. My experience goes to show that much better service can be rendered in all cases where sensitive conditions prevail, always providing of course that the cavity can be isolated and the field of operation properly insulated. The mental and physical strain on both patient and operator is reduced to a minimum, and the dread of the dental chair greatly lessened in our patients. Personally, I would not know how to keep house without it." Dr. D. H. Ziegler writes: "I am really afraid to answer your communication for fear my enthusiasm will carry me away. Honestly, I would not take $1,000 in cash for my

No. 30—*a*.

No. 30—*b*.

No. 30—*c*.

outfit if I could not replace it, for the simple reason that I can render better service to my patients with more comfort to myself, and needless to say, to the patient. The subject should be taught in our dental colleges on as broad a basis as dental anatomy, pathology, etc. The two subjects named are probably the most important in the dental curriculum." Dr. William Rollins, Boston, writes, "I should say that an apparatus for the electric numbing of sensitive dentin by cocain was indispensable." Dr. R. Ottolengui, New York, writes, "In regard to cataphoresis, while I believe that its use has been rather sporadic, there is no doubt that its usefulness is most patent, and there is little question that had the dental profession a greater knowledge of electricity, cataphoresis would have obtained a firmer hold as a necessary part of dental practice." Dr. W. T. Jackman, Cleveland, writes: "I believe that students should be taught the use

of electricity cataphorically for the reason that the hypersensitive patient must or should have electricity so applied." Dr. H. C. Kenyon, Cleveland, writes: "Cataphoresis not only enables me to render better service to my patients, but it enables me to give much service that would otherwise be out of the question. I make some failures with cataphoresis, but I am convinced that the blame for these is not to be laid to it nor to impossible conditions presented in the cases, but to my ignorance of the subject of electricity in general and of its application to dentistry in particular. Hence I argue for a more thorough course in the colleges. I think the place of electricity in the coming four years' course is just as important and should be just as well filled as bacteriology or dental medicine." Dr. E. B. Lodge, Cleveland, writes: "It must be conceded that the best equipped dental office of to-day is the one installed upon a basis of electricity. Cataphoresis should be one of the agencies at the hand of every dental operator. The experimental stage of the application of electricity being over, and the use of that agent being now safe and exact, we may well feel only partially equipped if our offices have not the perfect dental appliance. Can we render materially better service by the aid of cataphoresis? Yes. When a dentist is able to excavate an otherwise sensitive cavity without giving pain to his patient he suffers less with his patient and is therefore able to accomplish better and more quickly the ends necessary to make a good operation."

I think we have established that a large proportion of the best service we can render our patients is by and with electrical processes and devices. Now how is the dentist to become able to use them? Does he require a special knowledge to do so? Yes, he certainly does. An understanding of electricity and its wonderful behavior can be secured only by hard study. It does not come to any man by instinct. The average man can work it out for himself from books, but not without a great deal of hard study and experimentation. Then how must he obtain this understanding? He should see the various phenomena demonstrated and note their relation and causes and effects, and experimentally produce not only the various phenomena but also the apparatus to produce them. This means a thorough course in college. The coming generations of dentists should have this knowledge, because the present one has

left largely unused the proper application of electricity to dentistry, owing to not having a knowledge of the subject.

Someone may say, but the dental profession of to-day is not so ill-informed on the subject of electricity. The best persons to ask are the makers of electrical dental goods. One prominent dental manufacturing concern writes in reply to this question, "We find as a general thing that when we wish to sell electrical goods we are compelled first to teach the customer what we know about electricity. It is a common expression among the manufacturers of electrical goods that they must make same 'fool-proof.'" Another company writes: "We find that the best informed dentists in electrical appliances have but an imperfect knowledge of the fundamental laws pertaining to electrical science. We meet but few men who have any correct knowledge of the practical application of same, and the vast majority admit having no understanding of the subject whatever. Frequently men hesitate to adopt the use of any electrical appliances because they have a fear of them and cannot appreciate any difference between a high tension line of several thousand volts and a battery of a few volts, and so consider anything electrical to be dangerous. We find that little care is ever given to electrical appliances, because they are not understood and men prefer to leave them alone. Where an effort is made to keep a machine in good order the work is often misapplied. We have found it necessary to so construct and design all machines that they will continue to give good service with minimum care. Ninety-five per cent of the repairs we make would not be necessary did the owners possess a due appreciation of the requirements of the articles bought. In ordering, the mistake is frequently made of specifying a direct current motor when an alternating current machine is wanted, or vice-versa. We should indeed like to see someone publish a book that would enable the profession to gain some of the practical and theoretical knowledge pertaining to dental electric appliances."

There can be no doubt that the dentist of to-day should have and the dentist of to-morrow must have a thorough knowledge of dental electricity. If time had permitted I intended to tell you of some of the coming fields for applying an electrical knowledge in dentistry, particularly the electro-chemical phase of filling materials. There is a new universe opening up just here in dentistry. Also

the production of pain in our operations by static currents which pass from our bodies and the dental engines, etc., to the patient through the instrument and cavity, producing much pain, and how they can be detected and prevented. Also many new electrical devices and new practical applications of electricity in dentistry, like the sharpening of burs almost as good as new at almost no expense, but there is not time.

There is not time enough left to present in detail my idea of the methods by which electricity should be taught in dental colleges, but in brief it is as follows—Since electricity, mechanical work, and chemical reaction all have an equivalent, and the measure of one can be expressed directly in the equivalent units of the other, it becomes necessary for the student to study their relation and dependence on each other as they are presented in a general study of physics. This will be his foundation for all later intelligent study, and without it he cannot apply his knowledge to everything and everything to his knowledge. There is a future for the coming dentist that we cannot now even conceive, and above everything else he must have a good foundation. While this course in physics should be general, it should also be specially dental, that is, emphasizing the departments that will be most used, and should be largely a demonstrated lecture course. This should be followed by a practical laboratory course in applied physics, chiefly electro-physics and electro-chemistry. In this course the student should be taught and shown the detail of construction of all the principal apparatus he will afterward use, and he should be required to design and construct working models, to see that he understands perfectly both the principles of construction and the laws of cause and effect involved. This is very essential. In this practical course the student should make with his own hands and from his own designs a working permanent magnet and electro-magnet, a dry cell, a wet cell, a storage cell, a small motor, a small dynamo, a rheostat, a galvanometer, a small electric furnace, a small induction coil, a small faradic coil, an X-ray screen, prepare dental X-ray films, etc.

He should next receive a course in the practical application of electricity in practice, as in electro-therapeutics, electro-chemistry, etc. In this course he should be taught in detail the technique of applying cataphoresis for the desensitizing of sensitive dentin, the removal of pulps, etc.; the application of electrolysis in stimulating

pyorrhea pockets, in carrying medicaments into all tissues for disinfectant, anesthetic, and stimulating effects, as in abscesses and putrescent roots; the treatment of pyorrhea with the X-rays; the checking of excementosis by raying with the X-rays; locating missing teeth, faulty root filling, abscesses, pulp nodules, etc., with the X-rays; aborting abscesses with static current; how to use the antrum illuminator; the care and use of the root-canal dryer, the various mouth illuminators, the electric furnace, electric motors, electro-plating, X-ray tubes; making X-ray pictures, care and use of galvanic cells, etc. These three courses should be extended over the sophomore, junior and senior years in the order named. If he could get the general physics before entering college it would be decidedly an advantage.

Gentlemen, we have a sacred trust under Almighty God. To us is given the great responsibility, not simply of the destiny and qualification of the dentist of to-morrow, but the pain or joy of millions of people. May an infinite wisdom direct those upon whom the enormous responsibility shall fall of deciding the curriculum for the coming four-year course.

BUCCAL EXPRESSIONS OF CONSTITUTIONAL STATES.

BY EUGENE S. TALBOT, M. S., D. D. S., M. D., LL. D. READ BEFORE THE CHICAGO ACADEMY OF MEDICINE, OCT. 2, 1903.

There was a tempest in diagnosis over the death beds of Mary II of England and Louis XV of France, who both died of small-pox. The tempest in the case of Mary was due to a fight between society physicians and medical politicians, and was settled by the dictum of Radcliff, who had rare skill in diagnosis. The medical contest over Louis XV (1774) was essentially one between the partisans of the courtesan, Dubarry, and those of the Dauphin, afterward Louis XVI. The hesitation was pardonable, since forty-six years (1728) previously Louis XV had an attack of small-pox. The contest was more over the gravity of the disease than its type.

It is a singular illustration of the value of local conditions in diagnosis, as Voltaire points out, that just before the more serious symptoms of variola made their onset in 1774 Bourdet, the King's dentist, examining the royal mouth, recognized by the appearance of

the gums the premonitory symptoms of a serious malady and communicated his apprehensions to one of the ministers of state. Bourdet (Cabane's Secret Cabinet of History, page 49), like reputable dentists of that time, was medically educated, and so far as diagnosis then went was trained in local aspects of constitutional disease. Ere the days of the thermometer, stethoscope, and what are called instruments of precision, training in local expression of constitutional states was of necessity more exact and minute than when these instruments were at the service of the physician.

Clinicians, however, continued to value local manifestations. Obstetricians studied the mouth of pregnancy, alienists studied the mouth under scorbutic and cachetic aspects, and under those presented by paretic, paralytic, senile and terminal dementia.

As late as 1881 James Tyson (Bright's Disease and Diabetes) cited as local manifestations of diabetes "a spongy state of the gums, with recession and excavation resulting in extreme cases in absorption of the alveolar process and falling of the teeth." Magitot and other French clinicians had pointed out previously similar buccal manifestations in other constitutional states as well.

The disease called "pyorrhea alveolaris," under the most exact views of its pathology forced by bacteriology, especially the phase related to culture mediums, stimulated a more exact study of the constitutional states underlying buccal changes. In a discussion of the subject some years ago I pointed out that these might, like all local manifestations, have several relationships to the coincident constitutional state, they might be an expression of that state, they might be a complication, they might be an etiologic factor, or they might be a mere coincidence. This is true of all local manifestations, the medically vicious reflex hypothesis to the contrary notwithstanding. In a recent article influenced by the now general trend of specialties of medicine to consider constitutional relations of the local states, Campbell (British Dental Journal, June, 1903), ignoring most previous dental and medical literature, points out that the state of the mouth is to a considerable extent an index to the condition of a person's health. If an individual be free from bodily ailments, then as a rule the teeth and gums are sound and healthy. The state of the teeth must exert a constant influence upon the condition of the body, and as truly the general condition of the body exerts an important influence upon the state of the teeth, and it is this close

relationship of the state of the mouth to the state of the general health that makes the work of the dental surgeon of such paramount importance and interest to the physician.

By some it is asserted that morbid states of teeth, gums, alveoli, etc., are the cause of certain diseases. Hunter has endeavored to show that buccal sepsis, having its origin in long-continued and neglected cario-necrotic condition of the teeth, is the cause of pernicious anemia. This is due to special infection of the digestive tract, caused by buccal sepsis. Campbell, while not denying to buccal sepsis a contributory etiologic nature which in some cases may be considerable, is nevertheless convinced that it is not only not entirely responsible for the etiology of the disease but generally plays a minor part. He carefully investigated the condition of the mouth in every case of pernicious anemia that came under his notice, and found that while in the majority the gums were spongy, the teeth loose, with pus welling up by their sides and the gums receding, in others the teeth and gums showed no sign of the disease. According to his observation, such buccal conditions are an outcome rather than a cause.

The dental condition most frequently met with in diabetes is a loosening and painless shedding of sound teeth. Dental caries, gingivitis, and spongy or bleeding gums occur at times. Changes in the teeth due to the imperfect calcification of the enamel or dentin often supply a valuable record of the patient's biology. Other conditions of the mouth which will serve as a useful guide to the physician in making a diagnosis are the ground-down teeth of the gouty occasionally met, dental periostitis of the rheumatic, and caries or impaction as a cause of various ailments of children. Suspicion as to the presence of tubercular disease may be aroused from the pallor of the mucous membrane, or of Addison's disease from the presence of pigmentation. Certain poisons produce marked changes in the jaws and gums.

The condition of the teeth and gums affords satisfactory testimony as to the general state of health of an individual and is an invaluable aid to the physician in making a diagnosis. Owing to the transitory nature of the gums and alveolar process, and the fact that arteries and nerves therein contained are end organs, autotoxic and toxic states are often there indicated long before disease presents itself. Rapid decay of the teeth indicates neurasthenic, degenerate,

autotoxic and toxic conditions. Disorders of the teeth and gums cause accumulation of pathogenic bacteria which produce diphtherial, pneumonic, tubercular, and other mouth and throat lesions. Pus germs taken into the stomach and intestines cause indigestion in both. If inflammation of the intestinal tract be present pus germs will infect the part. Matter circulating in the blood causes irritation in the capillaries in the alveolar process. Odor is an expression of this poison eliminated through the throat and lungs.

In gout, rheumatism, Addison's disease, and most allied diseases peripheral nerves are irritated and degenerate. This is likewise true of the dental pulp which, as I have elsewhere shown, has a vasomotor system. When disease occurs the pulp nerves are irritated, and the arteries dilate and contract, modifying tooth resistance. Tooth decay so common in all constitutional disease is due to a want of tooth resistance. Pits and furrows upon the teeth indicate arrest of development due to malnutrition in utero or after birth while the teeth are forming. They may be due to syphilis or many other causes.

In dealing with the influence of buccal states on the constitution it must be remembered that when the eliminatory system is overstrained, especially when the poison-destroying function of the liver is deficient or impotent, the throat and gums play a great part in elimination, whence come, for example, the "blue" gum of lead-poisoning and the "green" gum of brass, as well as those from mercury, arsenic, potassium iodid, bromid, etc. Matter thus eliminated is reabsorbed, enters into the chyle with digested products, and readily becomes toxic to the blood cells. That cachetic states approximating pernicious anemia can thus be produced is clearly evident. Were fecal anemia existent ere the gum and throat changes were set up it would thus be greatly intensified. The toxemia producing this gum and throat state would be greatly increased through the overstrain of oxidizing processes produced by reabsorption of eliminated products. Interstitial gingivitis or pyorrhea alveolaris can, as Fitzgerald (Clinical Journal, March 6, 1899) and I have shown, be predisposed by neurasthenia and aggravate this.

The toxins generated in the mouth readily pass into the general system. As a result, chronic indigestion with coexistent pigment spots, urticaria, etc., may occur, as Herschell (Indigestion, 1895) has shown. Pus toxins, as in a case reported by Carr and Bough-

ton (Lancet Aug. 22, 1903), may thus produce a sapremia mimicing typhoid, as pigment spots readily simulate the typhoid eruption. In buccal manifestations of constitutional disease the vicious circle of pathology peculiarly occurs.

MATRICES, THEIR USES AND RETENTION.

BY LOUIS P. HALL, D.D.S. READ BEFORE THE MICHIGAN DENTAL ASSOCIATION, JULY 9, 1903.

A matrix is a mold which gives form to material forced into it. In dentistry it is used not only to give form to the filling, but by its use the cavity is changed from a difficult or complex form to a more simple one, thus facilitating the manipulation of the filling material, be it plastic or hard.

I am well aware that there are many who do not use a matrix at all. Some because they do not believe in them, some because *they* can do better without them, some because they haven't time, and some because they don't know how to use them.

The earlier and simpler forms of the matrix were made from pieces of gold plate, separating files, dress stays, etc. From time to time various improved matrices have been made and offered for sale. Of these each has its advantages and disadvantages. Matrices may be made from steel, German silver, or copper. The thickness, pliability or hardness of the material is much a matter of judgment and preference of the operator. In any case the thickness of material will depend as a rule upon the position of the teeth or space between them.

The pliability or stiffness of a matrix will depend much upon the form of the interproximal space and the method employed for holding the matrix to place, also the amount of force it will be required to withstand. With the later improved forms of matrix retainers, in which the support is evenly applied on both buccal and lingual sides, and often from occlusal to gingival, a much thinner and more pliable matrix can be used.

As the proximal cavities back of and including the cuspids present the most difficulties in filling, and especially the disto-proximal cavities, it is in these that the matrix proves itself of most aid. If, however, it can be used on the mesial without obstructing either the view or the access it will be of great help there.

With a matrix properly made and placed a filling can be inserted without so decided undercut or form. A strong heavy wall may be had at the gingival, the necessity for the deep grooves or starting points is done away with, as the definite angle formed by the matrix and floor of cavity is usually sufficient for starting, and with a firm seat for the filling anchorage may be had toward or on the occlusal surface.

If the matrix has been nicely adjusted the filling at the cervical margin will require but little or at least much less finishing than one done without a matrix. This alone is a great saving of time and vexation to both patient and operator, as it comes at the end of an already tiresome sitting.

Any matrix should be so shaped that when in position it will cut into or displace as little of the gum tissue as possible. If a thick matrix is used its edge should be beveled toward the tooth, so that as it is pressed into place the plane surface will hug the surface of the tooth, and the beveled side will easily displace the free margin of the gum. All matrices, thick or thin, should be free from rough edges or points that would tend to irritate the gums or cut the dam, and should not be higher than the occlusal marginal ridge. There are a few shapes and sizes of matrices that will fit a good many cases, but one should always have on hand materials of various kinds and thicknesses from which a matrix for a special case can be made.

If a case is presented in which not only the proximal wall is gone, but also more or less of either the buccal or lingual or some of each is lacking—and especially for heavy malleting—a heavy or stiff matrix can be used to best advantage. It would seem, though, that preference should be given to the thinner and more pliable materials when they can be held in position as well as in shape, for the reason that they are more readily adapted to the form of the tooth. The great objection to a stiff, springy matrix is that it is almost impossible to exactly fit it to the borders of the cavity, and unless it is so fitted when it is wedged up to place the spring tends to return to its original shape instead of lying closely in place. It would therefore seem best to at least draw the temper from thick matrix material before shaping it.

If the cervical portion is held firmly up to border of cavity it does not matter so much if the matrix does give some at the side

walls. In fact, it is quite as well to allow a little space here to make sure of full contouring, as this portion of the filling is more readily trimmed.

In general, the cavity should be prepared in the usual way before the matrix is placed, and one should be especially careful to either disk or in some way dress off the proximal borders so that the matrix will set smoothly around the tooth from that side.

One should be familiar with the shapes of the various teeth at the cervical border, remembering that the portion under the gum dips or slants toward the central axis of the tooth, so that even if it looks strong and broad it may be only a thin or frail edge of enamel.

Again, in the bucco-lingual direction the cervico-marginal border of a cavity sometimes dips toward the central axis, that is, it is concave instead of straight, as in the proximal surfaces of the first upper bicuspid, where there many times exists a deep groove running rootwise; and if the matrix is not fitted to that curve or a filling without a matrix is allowed to overlap at this curve, it is very difficult to remove the excess filling material, and if it is not removed it is always a source of annoyance and possibly a cause of recurrent caries.

The buccal and linguo-proximal walls if thin must be cut back until they are thick enough to have considerable strength, and then the matrix should be closely drawn or pressed up to the sides of the cavity, especially to the cervical border. In cases where the cavities are of so long standing that the teeth have fallen together from lack of proximal contact, the proximal walls must be cut back enough to allow of dressing them properly. After the matrix is in place separation of these teeth may be gained with much less danger to frail borders and walls, as the matrix will protect them.

I frequently use a matrix because it helps to carry the rubber down below the cavity margin when nothing else will do it. At other times I excavate all the rest of the cavity before touching the cervical wall, leaving that until the matrix is in place, because by so doing the matrix at that portion guides my instrument and I thus avoid disturbing the dam and gum and avoid bleeding and moisture at a part where they are difficult to control.

How shall we hold a matrix? A piece of dry wood cut to wedge

in two ways may be used, and if coated with sandarac varnish it will hold better, but it has many disadvantages. If the space between the teeth is very narrow the wooden wedge must be made so thin that it is difficult to force it into place without breaking. Second, the "embrasure," as Dr. Black calls the spaces buccal and lingual of the contact point, being of unequal width and shape, a single wedge will not bring both sides up to place, unless the matrix be of stiff, heavy material. This usually results in the loss of the proximal contact point, either because the matrix is too thick and there is too little separation, or because the wedge is too near the contact point; in either case the matrix at the cervix is apt not to be tight. Then, too, the driving of a wedge or two wedges is very unpleasant to the patient, as it must all be done at once. If one of the various separators be used, even if the clamp has to be removed, both sides of the matrix can be brought up close to both the buccal and lingual borders of the cavity.

Until within the past two years the writer has almost always used some one of the separators for holding the matrix, frequently holding two matrices, one to a mesial and another to a distal cavity, at the same time. One great advantage of the separator for holding the matrix is that it is easily readjusted and after the first layer or two of material has been malleted to place—if more space be needed for contour work, or if the teeth begin to spread—a little tightening of the separator readjusts the matrix and supports the teeth. When the fillings are completed a little loosening of the separator permits the removal of matrix and you have the separator still in place for finishing the fillings, especially on the proximal surface, and it is desirable that this should be done first so that the separator can be removed as soon as possible.

For the past year or so I have been using the Dickinson matrices and matrix-retainer more or less. These matrices are of very thin steel and hence are quite pliable and easily drawn to place by the retainer. Their original shape is good, but I cut them a good deal for special cases. This retainer is made on the plan of the Elliot separator, except that in place of the two fixed points of the separator Dr. Dickinson has attached two double wedge-shaped points in such a manner that they readily adapt themselves to the shape of the slant of the embrasures, thus drawing the thin

matrix up and giving it support along the entire lateral margin of the cavity.

Like almost all of our special instruments, this one will not work in all places. For instance, the cervical portions of the wedges do not always press in close enough to that border of matrix, and it has been the practice of some to insert a small piece of soft gutta-percha which, when hard, would cause the wedge to press up tight. It would seem better, however, to change the form of the wedge a little, so I have now three sets of wedge points for the Dickinson retainer. They were about alike at first, but I have ground them in pairs—rights and lefts—with a little closer regard to the anatomy of the teeth. As the wedges are easily removed by a half turn of a little screw it is possible to combine any two of them and in that way meet almost any given case. While with this retainer, as with the separator, the matrix can be easily readjusted and any amount of space for contour may be had, this retainer must be removed before the interproximal portion of a filling can be polished. It should be replaced with some other form of separator which will secure necessary space for finishing. This need not give much pain, as the teeth have already been separated.

Dr. G. W. Dittmar suggests the following method of making and retaining a new form of matrix. I have not used it, but it would seem that it might be very effective in certain cases. He makes a matrix of 32 to 35 B. & S. gauge copper or German silver plate properly shaped to fit the case. The ends of these matrices he roughens by cutting in their ends where they lie against the buccal and lingual walls five or six slits, not more than one half millimeter in depth, for holding the ligature by which he retains the matrix in place. A small hole is made with a plate punch near the buccal and lingual corners next to the gingival edge through which the ligature is passed before adjusting the matrix, which will prove a great convenience in placing it. By bending one or two flaps beween the slits on both ends of the matrix the subsequent strands of ligatures will be prevented from slipping up or down. Having placed the matrix in position, hold it so by tying the waxed silk ligature, then encircle the tooth from three to six times, being careful that none of the threads is placed on the contact point. This method of adjusting the matrix is especially applicable when plastic mate-

rials are used for filling. If necessary for more support a mechanical separator or wedge may be used.

Of the continuous band matrices on the market the Brophy has served a good purpose. The Lodge matrix appeals to me in many cases. The peculiar curve in which it is cut, together with its method of adjustment, enables one to bind the tooth very closely at the cervical margin while at the occlusal, and it gives ample room for contour work. It is easily adjusted and does not unnecessarily distend the cheek or lip. It does not, however, provide separation in closely-set teeth, nor can you often so adapt it that both the mesial and distal parts of a very deep compound filling can be filled at the same time.

Another matrix which received more or less attention at the meetings last winter is designed for the restoration of crowns of teeth entirely with amalgam, and also by some to hold together without a band the roots of molars that have been separated either by decay or accident. Pins are anchored in the roots. A band of soft steel or German silver about 30 gauge is passed around the exposed stump and the ends are drawn tightly together with flat-nosed pliers, the band is then removed and soldered with easy-flowing solder as held in the pliers. It is again placed on the tooth or a stick, given proper contour, and so trimmed that when placed in the mouth it does not interfere with occlusion. Into this is forced the alloy which is contoured above the band to suit the occlusion. The matrix may be left in the mouth until a subsequent sitting, when it is cut and removed and the final contour and finishing done.

I think the only time I have had occasion to use a matrix in an anterior tooth was when the lingual marginal ridges of a superior lateral incisor failed to unite properly, and formed a groove which extended rootwise far beyond the gum margin. I had great difficulty in keeping the cavity dry until I hit upon the expedient of slipping a thin, curved matrix between gum and tooth and holding it in place with a tightly-drawn copper wire. With this device I was able to fill all under the gum with tin and finish the filling with gold.

An S-shaped matrix is frequently of service in small proximal cavities that one does not feel warranted in cutting to the occlusal. Such cavities are sometimes found in the bicuspids and molars.

A very little extension upon the side from which you elect to work will give access, and with a matrix drawn tight to the far side it is comparatively easy to fill. By an S matrix I mean one that has a double or reverse curve from buccal to lingual, so that one point of a separator will draw the matrix against the tooth to be filled, while the other separator point will throw the other end of the matrix away from the portion of the cavity through which you fill, both points acting as usual for spaces.

I cannot feel, as some do, that the matrix should be used only for plastic fillings. I believe that by its aid many teeth can be successfully filled with gold that are usually filled with amalgam, and with the aid of a matrix many teeth could be filled with *something* which would otherwise be extracted if the patient could not afford a crown.

There are special objections to using a matrix on a mesial cavity. On the distal surface of a cavity the matrix border is in plain view, and it is comparatively easy to fill each point if care is used. On the mesial surface much care must be used, because the matrix tends to obscure the view and cut off the access, and unless great care is taken the operator need not be surprised when he has removed the matrix if he finds the borders unfilled. A mesial matrix for malleted work should be as narrow as possible and used perhaps only in starting a filling. Of course no matrix should be used when there is free access and no closely-approximating teeth. For plastic work a mesial matrix is as essential as is a distal, for all cavities filled with amalgam must have continuous surrounding walls during the building of the filling.

It may not be out of place to say a word or two as to cavity preparation, especially at the margin next to matrix. The borders adjacent to the matrix should be cut at nearly right angles to it, whether they are wholly on the proximal or to the buccal or lingual sides, so that acute angles which are difficult to fill may be avoided. With the matrix in place the margins should again be examined carefully, for sometimes in drawing the matrix to place the edges are liable to be chipped. This would of course make it difficult if not impracticable to secure perfect adaptation of gold or other hard materials. Even amalgam would not be adapted as closely as it might be to a more perfect wall.

PROFESSIONAL RESPONSIBILITY.

BY A. E. BALDWIN, M.D., D.D.S., CHICAGO. READ BEFORE THE SECTION ON STOMATOLOGY, AMERICAN MEDICAL ASSOCIATION, MAY, 1903.

We stand before the public and the general profession as the guardians of the entrance to the alimentary canal, and these responsibilities laid upon us determine many things in connection with the general health of our patrons. These responsibilities begin in advising our patrons as to the carefulness with which the temporary teeth of the little ones should be protected, as well as advising as to the care of the permanent teeth which obtains in later years. In former papers read before this and other gatherings the writer has urged upon the general profession, as well as our special department, the care which should be bestowed upon the deciduous teeth. It doubtless is overlooked by many of the general practitioners, and judging from the writer's observation, by many even in our special field, that the teeth of the growing child should be kept more carefully even than the teeth of the adult. A reason apparent to all is that while in adult life only nutrition enough to make up for the waste of tissues is necessary, in the growing child there are many reasons why added nutrition should be obtained, chief among which may be mentioned that the tissue waste which must be made up is fully as great in proportion as in the adult, while with the child there is a rapid development of the general system, requiring much additional nutriment. Indirectly there are many other reasons, among which are these: A child has a vigorous and almost unlimited appetite; if these deciduous molar teeth are allowed to become sensitive, painful, or lost, the mastication of the child is necessarily hampered, and it is an axiom that a child will never masticate food if by so doing pain is caused They very early in life learn that despicable trick of "bolting" their food with but little or no mastication, if mastication is in any way disagreeable, thus fixing upon them a habit for life which is conducive to many of the ills of indigestion and malnutrition. A still further reason is that all teeth at all ages have a tendency to move toward the median line of the mouth; hence if one of these deciduous teeth is extracted before its successor is ready to erupt the teeth behind will move toward the front, thus preventing the proper eruption and proper development and expansion of the arch, and

causing the coming in of the teeth in abnormal positions, and also creating irregularity and its subsequent ills.

The writer has always urged upon the general profession and our special department that exceeding care should be given to the deciduous molar teeth, and our patients should be impressed to urge upon the child a thorough use of the brush, and frequent inspections of these teeth, and that at the least suspicion of decay they should be given immediate professional attention, thus preserving them in a healthful condition, so that mastication can be performed fully and that the ills resulting from "bolting" of food may not invade the stomach of the little patient, bringing upon it all the ills of indigestion, characterized frequently by the recognition of a very nervous little one, whose only trouble probably is dyspepsia caused by lack of the above attentions. The writer would urge upon our specialty that careful attention be given to these teeth until the time for them to be replaced by the permanent bicuspids, as well as the great care that should be observed with regard to the first permanent molar, which is erupted at about the sixth year of age, and the molars which are subsequently erupted.

This first permanent molar, we all recognize as the abutment of the arch, and from its location, position, size, and attachments it is the most important tooth of the mouth to be preserved at this or any subsequent period. The loss of this tooth or lack of attention thereto, as well as the lack of care of the deciduous molars, in the writer's belief produces most of the cases of irregularities and deformities of the lower part of the face, nature having evidently intended that the lower part of the face should be developed and expansion thereof attended by the gradual wedging in and pushing apart of the alveolar process by the eruption of the larger teeth of the permanent set.

The writer would also condemn the custom illustrated by the following experience which lately came to him. A gentleman of a neighboring city, whose record for general professional standing is high, had a patient under his care for many years. The family had lately removed to our city, and this patient fell under the writer's professional care. Upon calling his attention to many small cavities in the teeth, the patient explained that his former attendant had said he knew there were many small cavities, but that it would be better to wait and fill them later. This is one of the greatest

of fallacies, and one which obtains more largely than is generally admitted. The writer's belief is that whenever we have an opportunity to examine a patient's mouth we should give it a most careful and thorough inspection, calling the patient's attention to all of the defects which can be found, and urging the importance of early attention thereto. Especially would he suggest that if any teeth are left unattended they should be those which have large cavities therein; in other words, he would urge that if any teeth are given attention by the patient, the ones attended to should be at least those which have the small cavities, thus keeping them from getting bad. A common expression of the writer's to such patients is as follows: "If for any reason you wish only two or three teeth filled, and those which need it the most, I will immediately, after careful inspection, fill the three teeth which have the smallest observable points of decay, thus preserving these teeth from becoming bad, and the very bad ones will get only a little worse." This will illustrate the position of the writer perhaps as well as could be otherwise expressed. His observation has led him to believe that many of our specialty do not recognize the importance of thus acting. In fact, the writer's attention has been called by several men of prominence to the fact that by so doing one gets the name of being a high-priced dentist, and is thus marked as one to be shunned, when as a matter of fact such practice, while it causes much more work to be done at the time, saves a great amount of work in subsequent sittings of the same patient, as observed in a practice extending over a number of years.

The writer believes that we have large responsibilities also in careful observation of the relations which are borne by the teeth, their eruption, care or lack of care, upon the general health of the patient, as well as reflex disturbances which may be brought about by this irritation in other of the special organs of the head. Cases could be cited which would illustrate this, and the writer thinks that this matter is generally accepted as true by the profession at large, but that sufficient care and thoroughness are not observed in a general way as to the minute observations of this rule in general practice.

Another responsibility which we face is that of supplying a masticating apparatus when the natural teeth and roots, or at least many of them, have been lost. Crown and bridgework may be

made most useful as a conserver or restorer of health when a lack of mastication has caused disordered digestion and the accompanying ills, and yet a note of warning should be sounded that bridgework or crowns may by improper adjustment be made to cause the very ills which they are intended to rectify. Great care and thoughtfulness must be bestowed upon bridgework and crowns to see that the articulation is made natural, and that the force of mastication may be upon the lines of natural resistance which would have obtained had the natural teeth not been lost. The writer has seen many bridges which were absolutely useless in themselves, and which caused the loss of many of the abutments thereto, thus making the last condition of the patient worse than the first. Our effort should always be to advise and recommend those things which we feel assured will be for the permanent welfare of the patient, never allowing ourselves to be misled by any suggestion of his, or any wish to have cheap or overexpensive work done, if in our belief such work is unwarranted for permanent results.

EXPANSION OF PLASTER OF PARIS AND ITS BEARING ON THE USE OF THIS MATERIAL FOR IMPRESSIONS AND MODELS.

BY J. H. PROTHERO, D. D. S., CHICAGO. READ BEFORE THE ILLINOIS STATE DENTAL SOCIETY, AT BLOOMINGTON, MAY 12-14, 1903.

More than forty years ago the fact was recognized that plaster of Paris expanded during and after setting, so the study of this peculiar physical property is not a new one. Since 1860 a number of articles by various authors have appeared in the dental journals from time to time, presenting different phases of this subject, in most of which some method was recommended for obviating the difficulty.

Recognizing that our knowledge of the physical properties of plaster, especially of expansion, is limited and vague, that there is considerable divergence of opinion as to the best means of controlling same, that none of the methods recommended is entirely satisfactory, and that this expansive movement has an important bearing on the adaptation of dentures, I present this brief paper with the hope of interesting you and enlisting your efforts in solv-

ing a source of trouble which is undoubtedly responsible for some of the many failures in prosthetic dentistry.

From observation of the experiments recently conducted it seems that freshly-mixed plaster ordinarily contracts and then expands when it first begins to set. Occasionally a slight contraction is noticeable when the casts have become thoroughly dry, but the amount of this second contraction is very small, not being more than one or two per cent of the expansion which occurs.

More or less heat is generated during the setting process, due doubtless to the more intimate union of the calcium sulphate with the water than occurs when the mix is first made, which results in a more or less imperfect crystallization of the former.

The contractile period usually lasts until the evolution of heat becomes apparent, when it ceases and expansion sets in. In an ordinary mix of plaster, one which sets in from two to three minutes, the contractile period lasts from one to four minutes. This is followed by a short period of inertia, after which expansion begins.

Expansion usually sets in slowly, increases rapidly after a minute or two, then decreases, gradually at first, then more slowly until all movement ceases. Usually the greatest expansion is over in ten minutes, although the movement often continues for twenty-four hours or more, after which follows a slight contraction, as has been stated.

The influence of long stirring on the property of expansion is not as generally understood as it should be. Continued or rapid stirring largely increases the rate as well as the amount of movement, depending on the length of time the mass is stirred. So sensitive is plaster to manipulation that it seems impossible to secure exactly uniform results in different mixes, although the conditions in every particular are as similar as it is possible to have them.

The effect of long stirring is shown in the following record:

Stirred	¾	min.	2	points—	10	min.	or	total	101½
"	1	"	32	"	10	"	"	"	93½
"	1¼	"	61	"	10	"	"	"	118½
"	1½	"	93	"	10	"	"	"	134
"	2	"	118	"	10	"	"	"	157½

Two mixes made yesterday in the clinic, one by Dr. Sitherwood and one by myself, showed as follows: Ordinary mix, Dr. Sitherwood stirred 1½ minutes, showed 15½ points contraction in 4

minutes, and 15½ points plus 85 points expansion, or a total of 100½ points expansion in 20 minutes, and it was still expanding when taken from micrometer. The second mix was made in a similar way, but stirred only 30 seconds. This showed 18½ points contraction in 5 minutes and a total expansion of 102 points in one hour. Nothing was added to the water in either case to control expansion.

The real difficulty resulting from expansion in practical work is in the tendency of impressions and models to warp when allowed to stand in the tray for any length of time after the plaster has set.

In a paper read before the Chicago Dental Society in March of this year reference was made to an old experiment described by Dr. W. Bowman McLeod as follows: This consisted in mixing and pouring plaster-of-Paris on a flat slab around the margins of which metal bars were firmly fixed in order to confine the plaster. In twenty-four hours the slab was sawed diagonally through the center, when it was found that the plaster had bowed up in the central portion to a very considerable extent. This was due to the fact that the bars prevented lateral expansion but did not confine the material on its upper surface, hence the movement in this direction.

The practical deduction from this illustration may be made by considering the form of the ordinary impression. The sides of the tray act in a manner similar to the bars on the slab and prevent lateral expansion of the impression. The palatine portion, not being confined, leaves the tray in this region, while those portions next to the sides remain in close contact. This constitutes warpage or a change from the exact form of the mouth from which the impression was taken.

Should the model be run up and allowed to stand in the impression for any length of time it also will warp in the palatine portion and thus two errors occur. A denture moulded over such a model will touch the palatine portion of the mouth before it is firmly seated on the alveolar border, and under stress of mastication will tip readily, while in many instances no adhesion is present at all.

At the present time I am unable to offer more than a few suggestions that may be helpful in lessening the difficulty. First, the addition of sulphate of potash to the water used in mixing, in the proportion of 5 grams of the former to 40 cc. of the latter, accelerates setting and partially controls expansion. About 55 or 60

grams of plaster-of-Paris will be needed to make a mass of good working consistency. The potassium sulphate should be added to the water and dissolved, then the plaster slowly sifted into it.

Second, the mass should be stirred as little as possible to insure a uniform mix. The spatula should be passed slowly and with a sweeping motion through the mass and around the sides of the bowl as few times as possible to secure the desired results. Then place the mass quickly in the tray, and if too soft for introduction into the mouth wait until it is thick enough to meet the requirements of the case. The same plan should be followed in mixing the plaster for a model, with the exception that the mass can be made a trifle thicker by the addition of a little more plaster.

If care is taken mixes made in this manner should not expand more than 10 or 15 points, while if made without the addition of potassium sulphate and stirred recklessly the expansion may run to 100 or even 150 points.

Immediately upon the removal of the impression from the mouth it should be trimmed on those surfaces impressed by the hard areas of the mouth, especially in the central palatine portion, the surface covered with some separating medium, and the model run up. As soon as the plaster constituting the model has hardened sufficiently the tray should be immediately removed and then the impression from the model. This will obviate warpage to a considerable extent but will not prevent any tendency of the plaster to expand. To compensate for general expansion the model can be scraped around the periphery along the line where the margin of the denture will terminate.

At the present time I must confess that some of the singular results noted with the micrometer have confused me. I believe some means will eventually be found for controlling expansion, either by the addition of some substance to the plaster or by a change in its mode of preparation at the mill.

Discussion.—*Dr. Hart J. Goslee*, Chicago: This is too important a subject to be discussed by one who has had no opportunity to study or prepare himself, or who has no knowledge at all of the paper. I should have been glad to have received a copy of the paper beforehand. It is very true that the expansion of plaster is the cause of a large percentage of the poorly-fitting dentures we often see, and even when the greatest care and every possible pre-

caution have been observed throughout the entire procedure incident to the construction of the denture the result is frequently a failure. It was a surprise to me to learn that the continued mixing of plaster had a tendency to increase the expansion incident to its crystallization, but this fact merely emphasizes the importance of the subject and the need for great care in manipulating the material. We gather from Dr. Prothero's experiments—first, that we should fill the impressions as soon as possible after removing them from the mouth, and second, that we should separate the models from the impressions as speedily as possible.

Dr. J. E. Hinkins, Chicago: I can now see why so many of us who do plate work have failures, and I should not be surprised to learn that where plaster is used in bridgework its shrinkage has considerable to do with checking the teeth. Plaster of Paris is a peculiar substance. When sulphate of calcium is saturated it will absorb about twenty-five per cent of water in crystallization. As the essayist explained, when it absorbs that amount of water it must have some play and so bulges in the center of the impression. This is what makes so many plates rock. Then after it stands a while it readily gives up the water of crystallization and begins to shrink. The only reason I can see why sulphate of potassium would make plaster set quicker is that a certain percentage of calcium oxid is held in solution in the sulphate of calcium, and the addition of sulphate of potassium brings the oxid of calcium into the double sulphate of calcium and potassium, and after it stands a while you have a sulphate of calcium and a hydrate of potassium.

I would ask the essayist if he has observed any difference in plaster coming from different parts of the country.

Dr. Prothero: Various dealers have informed me that they all use French's plaster, and it is the only one that I used in my experiments.

Dr. E. MaWhinney, Chicago: I simply wish to say a word of commendation and encouragement to Dr. Prothero, for I have a personal sympathy for any one who is trying to do original work. All of us will reap a practical benefit from it.

Dr. T. W. Pritchett, Whitehall, Ill.: I would ask Dr. Prothero if he has observed that the thickness of the mass causes any material difference in the expansion and contraction or in the change of form.

Dr. Prothero: Not enough to mention.

Dr. Pritchett: Then a very small quantity of plaster over the central portion of the mouth or an equal quantity over the whole surface of the mouth would make no difference? Also, the taking of an impression in some other material, then cutting away a portion and adding a thin mass of plaster, and placing that in the mouth does not make any more difference than if the whole mass were plaster?

Dr. Prothero: It would make some little difference because of the heat generated, but not much.

Dr. C. J. Sowle, Rockford, Ill.: Dr. Prothero is doing a good work and I wish to encourage him in every possible way, but I want to discourage the manner in which he presented his subject. Although I wrote him twice for copies of his paper to send to those who were selected to discuss it, I did not receive a word, and on arriving here learned that the paper had not been completed. It is hardly fair to ask a man to discuss a paper which he has never seen, and it is not doing justice to him or the society or the author.

Dr. Prothero, closing discussion: I owe an apology to the society and to these gentlemen who have discussed the paper for not having placed it in their hands before the meeting. Several causes combined to delay its completion until to-day, the principal one of which was some tests that were being repeated to verify previous results. Some experiments have been made with investment compounds and without exception every one when heated showed marked contraction, some more than others. In one case a piece of investment the size of an ordinary model showed more than one-tenth of an inch contraction, sufficient to cause decided warpage in an invested piece. I also tested some samples of a "non-expansive" plaster, one of which showed an expansion of 33 points in 18 minutes, and another mix expanded 52 points in 20 minutes.

RESISTANCE OF GERMS TO LIGHT.—Kirstein (*Zeitschrift fur Hygiene, Modern Medicine*) has shown that in the form of droplets or fine dust the germs here named are able to survive only for the designated periods under the conditions indicated: Typhoid bacillus, twenty-four hours' exposure to light; diphtheria bacillus, twenty-four to forty-eight hours in light, five days in the dark; tubercle bacillus, five days in the light, twenty-two days in the dark; staphylococcus aureus, eight to ten days in the light, thirty-five days in the dark; streptococcus, ten days in the light, thirty-eight days in the dark; the spores of the charbon bacillus, ten days in the light, at least three months in the dark.

Digests.

MEDICAL ASPECTS OF DENTAL LESIONS. By Samuel A. Hopkins, M.D., D.D.S., Boston. Read before The New York Institute of Stomatology, April 7, 1903. When we consider what an inviting field for medical investigation the mouth and the teeth furnish, it is difficult to understand why medical men have so long failed to appreciate the agency of the teeth in giving rise to and in aggravating diseases in other organs. Not only have dental lesions been left for the dentist to treat, but the physician has too often failed to recognize their importance in diagnosis. Whether it be ears, throat, nose, eyes, glandular diseases, or diseases in more remote organs, almost every case reported as having its origin in diseased teeth bears with it a confession of failure on the part of the physician to make an early and successful diagnosis.

In the text-books we find brief allusions to the teeth as possible disturbers of neighboring organs, but except where the first dentition is made the scapegoat to bear the burden of every childish ailment, very little is said which would serve as a guide to the physician in making a diagnosis of diseases having their origin in the teeth and surrounding tissue. There are no diseases of the ear, of the eye, or of any other part of our anatomy that can be exorcised so quickly as those which have their origin in diseases of the mouth and teeth.

It may be well to refresh our memories by referring to some of the diseases which have their origin in dental disturbances, and by way of reciprocity to refer to some of those cases in which general diseases affect the teeth and associate parts. We may safely pass over the diseases which come with eruption of the first teeth, because undue prominence is apt to be given to this perfectly normal physiological condition as a feature in the diseases of childhood. We are apt to forget that during this period not only is the mouth undergoing a change, but the follicular apparatus of the stomach and intestinal canal is undergoing rapid development, and a remarkable change is taking place in anticipation of the mixed diet which is to come with the development of the first teeth. Not only the alimentary canal, but every organ in the body is undergoing rapid development, and the nervous system, particularly the cerebrospinal system, is in a condition of exceedingly high functional activity,

wherein it responds quickly and in an exaggerated degree to an irritation that would go unnoticed at a less excitable period. It is no wonder that excess or irregularities in diet, be they ever so slight, should be able to throw the delicate mechanism of development out of gear. It is no wonder that any exposure to cold or contagion should find the system of the teething child an easy mark for the destructive arrows of disease. It is no wonder if at this period the least departure from hygienic principles should be punished with quickly following illness, nor is it any wonder that some irritation should be manifested as a result of the efforts of the teeth to force their way through the gums. It is well to remember, however, that the diseases which we are apt to attribute to first dentition would seldom arise were it not for the fact that the condition of the infant organism is so susceptible at this period that the slightest influence has exaggerated power to disturb the entire system.

It is not quite the same with second dentition, for here, with the exception of those mysterious changes which take place at puberty—which are psychological as well as physiological, and which we can neither fully understand nor explain—we have the body unaffected by unusual changes in the progress of its development. With the eruption of the first molars we frequently have a period of general depression and nervous irritation. If we recognize this condition it will make us more patient and forbearing if the little victim gives way to his feelings and is not quite as amenable to discipline as we could wish. Usually this passes away as soon as the teeth come through, and treatment is seldom required. It does, however, happen at this period that because the gum is swollen and painful to chew upon the child will bolt his food, washing it down with water or milk, or will refuse altogether to eat solid food, thus giving rise to serious digestive disturbances. In a like manner when the bicuspids come through, pushing before them the molars of the deciduous set, digestive disturbances again may arise from the inability or unwillingness of the little patient to chew his food. It will be a great gain to the child if the physician is quick to discover the source of these slight troubles and take the necessary steps to relieve them. Acting in the same way, a carious and painful temporary tooth will break up the habit of mastication and bring on diseases of the stomach and intestines that are capable of wrecking the happiness of a lifetime.

It is imperative then that we should be on the lookout for disorders of second dentition, and it is moreover exceedingly important that the temporary teeth should be kept free from disease in order that mastication may be properly performed. The physician will also find that many cases of stomatitis of an ulcerative type may be accounted for by the eruption of first molars and bicuspid teeth. These cases all yield to simple treatment if the source of the irritation is once discovered.

Ordinarily the eruption of the second molars is unnoticed, yet it would be well to remember that they are capable of setting up a severe train of nervous and constitutional symptoms. This is particularly true in cases where the jaw is short and the teeth are crowded. If hysteria, fretfulness, loss of appetite, irritation of the eyes and ears, with anemia, occur about the tenth to the twelfth year, it will pay to have a careful examination made to discover if a lower second molar painfully pushing its way towards the surface may not give rise to these symptoms. Frequently the X-ray will have to be employed to give the exact position of the tooth in the jaw and its relation to the other teeth, as upon this knowledge will depend the treatment. So much for the disorders to which the eruption of the teeth gives rise.

Before taking up the somewhat formidable list of evils which the teeth are capable of producing, it may be well to mention the fact that not only do diseases of the teeth produce constitutional disturbances, but constitutional disturbances may reveal themselves in severely painful attacks of odontalgia. We have all, I fancy, a certain chamber of horrors in our memory, the door of which we keep closed even to our intimate friends. Occasionally we are obliged to go in ourselves and view the unlovely skeletons of our earlier mistakes. It is not a pleasant duty, and we close the door as quickly as possible and pray that the repulsive adornments may not be increased. Most of us who have practised dentistry remember having been baffled almost to the point of desperation by severe pain, often recurrent and sometimes long continued, in a tooth or teeth that were apparently sound. Often mistaking such a condition for the pain arising from exostosis or from the deposit of pulp-stones, we have destroyed the pulp, only to have the pain continue or pass into an adjoining tooth. Too late we have discovered that malaria

or rheumatism, or some other general disease, had started up a train of symptoms that culminated in this painful condition of the teeth.

It will never be easy to make the diagnosis, but it will often serve us in time of need to remember that such reflexes may occur not only from malaria and rheumatism, but from diseases of the eye and stomach as well. During the menstrual period the teeth are frequently sensitive and uncomfortable. Toothache during the nausea of sea-sickness is of common occurrence, and is relieved by the vomiting which follows. Hysteria finds the teeth a favorite part of the body in which to end its erratic course, and a disorder of the brain may readily involve a perfectly sound set of teeth. As the human organism is a very perfect unit, it is difficult to imagine any serious affection of one part that may not give rise to reflex symptoms in another, and while in the present state of our knowledge it is impossible to classify these symptoms with accuracy, yet a proper realization of the broad principle of unity in all bodily ailments may help us to avoid serious mistakes in diagnosis.

We now come to a consideration of diseases of neighboring organs induced by carious teeth, or by abscesses or other abnormal conditions of the teeth and surrounding tissue. One of the most offensive conditions which diseases of the teeth give rise to is that which is accompanied by chronic discharge from the nose. Such a discharge may be due to syphilis, lupus, necroses of the bones or cartilages, or inflammation of the frontal and maxillary sinuses, but is very commonly found to have its origin in a diseased tooth. A glance at the relation of the upper incisor teeth to the nasal fossa and the relation of the posterior teeth to the antrum of Highmore will immediately discover the means by which an alveolar abscess, or even less violent inflammation of the pericemental membrane, may be communicated to the frontal and maxillary sinuses and other neighboring organs and produce a train of symptoms difficult to distinguish from chronic nasal catarrh.

So frequently is a diseased tooth the seat of the trouble that it should be a matter of routine to have an examination of the teeth made in every such case. I do not mean a cursory glance by the physician, but the most searching test of all the upper teeth should be made by a competent dentist. After excluding syphilis and lupus, the chances of the teeth being involved are very great. In the case of the front teeth the discharge is usually not very offensive,

When the antrum is involved by diseased conditions of the posterior teeth the thickening of the mucous membrane blocks up the opening so that the discharge is retained until it becomes in some instances as offensive as that which accompanies syphilis. There is a long train of general symptoms, chill, fever, prostration, etc., which I need not go into, but I wish to emphasize the following suggestion, and beg of you to accept it as a rule of practice. Given chronic nasal catarrh, always have the teeth carefully examined. Another suggestion in this connection—having removed the cause, do not do too much in the way of treatment. There is a dangerous tendency to keep up the irritation by the too frequent use of the probe and syringe. Secure the drainage and, after one or two washings with non-irritating antiseptics, give nature a chance. It is true that she may be more interested in raising a group of pyogenic bacteria than in the cure of the patient, but there is a good prospect of her effecting a cure if not interfered with too much.

Besides the nasal inflammation which arises from a diseased anterior upper tooth, inflammation extending from one of the lower teeth, particularly one of the lower third molars, has also been known to give rise to inflammation of the nasal mucous membrane and a consequent discharge from the nose. We may also have an inflammation from a tooth which will pass over the roof of the mouth and palatal arch and, extending to the pharynx, cause catarrhal pharyngitis, or it may pass to the middle fossæ of the nose, causing hyperemia of the turbinated bodies and acute rhinitis.

Consideration of the subject of nasal catarrh brings us to the subject of otitis media. I do not know but the aural specialist will consider my statement too sweeping, but I am led to believe from my own observation and from a study of the literature of the subject that disease of the middle ear is almost always preceded by a catarrhal disease of the nasal mucous membrane, and this, we have just seen, is frequently provoked by a diseased tooth. Therefore otitis media may be and frequently is caused by a diseased tooth. Disease of the ear may be reflex in its nature or may be the direct extension of inflammation from a tooth. In some cases this inflammation may result in the closing of the Eustachian tube. The closing of the tube produces a partial vacuum in the canal and tympanic cavity. The pressure of the outside air against the membrana tympani drives it inward and stretches it to its utmost capacity.

This tension not only causes severe pain, but there is naturally pressure on the blood-vessels. Venous engorgement occurs, and is followed by congestion, inflammation, suppuration, and rupture of the drum-head.

While many cases of direct continuation of the inflammation from the tooth to the ear may be cited, the number caused by reflex action through the vasomotor centres is far greater than we have ever imagined. We know that the normal caliber and tone of the arteries is maintained by the action of the vasomotor centre. The sympathetic ganglia have the power of receiving impressions from one direction and reflexly referring them to an entirely different organ. The sympathetic ganglia are closely connected with the general vasomotor centre, and physiologists have shown that the vascularity of a part may be augmented or inhibited, first, by irritation or stimulation applied to the part itself; second, by stimulation of some other part acting through the general vasomotor centre; third, by stimulation acting directly on the vasomotor centre. If you keep in mind the fact that the middle coat of the arteries is largely made up of circular muscular fibers, and remember that nerve fibers belonging to the sympathetic system are distributed to these blood-vessels, you will comprehend how the blood-supply may be altered, not only by the reflex action of an irritation at some remote part, but even by a wave of emotion or a passing thought as exemplified in the action of blushing. The familiar physiological experiment of dividing the cervical sympathetic in a rabbit relaxes the blood-vessels of the ear where the changes can be beautifully observed. The arteries become engorged with blood and minute arteries that had escaped attention become easily distinguished. If the cut nerve be stimulated the blood disappears and the ear becomes even paler than normal.

We have only to remember that inflammation is the result of congestion and venous engorgement, and we can see plainly how an irritation from an exposed pulp, from pulp-stones, from an abscess, from an impacted third molar, from pyorrhea alveolaris, or other diseased conditions of the gum and mucous membrane of the mouth may be transmitted by the nerve coming from the tooth through some of the sympathetic ganglia to the nerves supplying the blood-vessels, not only of the middle ear, but to the external auditory meatus as well, and it will readily be seen that there is scarcely a diseased condition of the ear that may not be produced by dental

irritation. Twenty years ago Dr. Samuel Sexton in reviewing the records of fifteen hundred cases of aural disease said, "Perhaps one-third owe their origin or continuance in a greater or less degree to diseases of the teeth."

It had been my intention to complete this paper by referring to diseases of the eye, the stomach, and the nervous system, which frequently arise from diseases of the teeth and are cured by the proper treatment of those organs. I have said enough, however, to make it plain that such an association must exist, and to warn the practitioner to be ever on the alert to trace to their proper origin the many unexplained and elusive disturbances now too often overlooked. I am obliged to close this part of my paper in a somewhat unfinished state, in order to give you an account of some bacteriological work which I feel will be of interest to the dental profession, because it brings out some important characteristics of growth which certain mouth bacteria possess, and has an intimate connection with the prevention of dental and medical lesions.

It has long been known that nearly every common form of bacteria, both of the pathogenic and non-pathogenic variety, finds its way at some time or other into the human mouth. Many forms which appear in cultures or cover-slip preparations from the mouth must be looked upon as but temporary—perhaps only momentary—lodgers in the oral cavity, while others can be observed with relative frequency. Still others are so generally and constantly to be found in the mouth that while it would hardly be safe to say that they were actually indigenous, it can be asserted without hesitation that there they find conditions suitable to their growth and rapid development. Leaving out of consideration the non-pathogenic varieties and several still unclassified organisms that are slightly pathogenic for small animals, there remain several varieties having undoubted power to produce disease that occur with sufficient frequency in the human mouth to arrest our attention and suggest a possible danger.

The staphylococcus pyogenes aureus is perhaps the most common of the pyogenic forms. Black found this organism in seventy per cent of the mouths he examined. The observations of the writer would lead him to look upon this estimate as much too high, but the organism is found with sufficient frequency to entitle it to be classified with those bacteria commonly found in the human mouth. The micrococcus tetragenus is found in the sputum of tuberculous

patients in nearly every case (Koch), but whether it plays a part of any importance in connection with that disease has not as yet been satisfactorily determined. It is found also in perfectly healthy mouths with varying frequency, and it has been stated that saliva containing this bacillus is fatal to mice and guinea-pigs. In those cases studied by the writer this did not always prove to be the case, but Biondi and others have noticed this fatal action. This action is not to be confounded with the fatal action of the micrococcus of sputum septicemia or micrococcus lanceolatus, as it is variously called. While the latter organism is, according to Fränkel and Weichselbaum, almost always present in the mouths of those suffering from croupous pneumonia, it is by no means uncommon in the mouths of healthy persons. This organism, the micrococcus lanceolatus, was discovered by Sternberg in 1880, who found it in the oral cavity of about twenty per cent of the healthy mouths examined. The fact that it has been found in the pleura, in the middle ear, in the frontal sinus, and in the antrum suggests many possibilities of evil. In the experiments about to be described it was exceedingly baffling in its variation in pathogenic power.

Taking these three pathogenic mouth forms, because of their wide distribution and the ease with which they could be found, experiments were begun to explain if possible the facts noted by many observers, that these and other pathogenic bacteria varied greatly in their virulence in different mouths and also in the same mouth at different periods. It was believed that by studying the pathogenic properties of the mouth forms under varying conditions light might be thrown upon the question of variations in the severity of disease which are so often observed. It was hoped also to discover some explanation to account for the difference in the virulence of bacteria from different mouths and from the same mouths at different times. This, it was hoped, might lead to the discovery of some inhibitive force which retarded bacterial activity and which would lead to the prevention of disease. Experiments were naturally first directed towards the saliva, with the hope of finding that some inhibitive action existed in the secretions that would account for the variation in the action of the bacteria of the mouth. This, however, did not prove to be the case. Unsterilized saliva from a healthy mouth did seem to restrict the action of the aureus and the micrococcus lanceolatus by causing increased phagocytosis in the animals experimented

upon. Sterilized saliva, however, had no such action, although great care was taken to sterilize it by long exposure to a temperature not high enough to affect the ptyalin. This temperature was found to be slightly below 65° C. Saliva sterilized in this way or by means of a Chamberlain filter (both methods being exceedingly laborious and requiring great care and patience) was not found to have any effect upon the pathogenic action of the bacteria referred to, either when injected in connection with the bacteria or when injected separately, either previous to or after the inoculation of the animal; nor was the growth of these forms perceptibly altered or their virulence changed by the addition of sterilized saliva to the culture medium in which they were growing. It was evident that while the saliva might in an unsterilized condition contain many innocent forms of bacteria which would awaken the phagocytes to action or give rise to enzymes which might change the action of pathogenic forms, it was probable that the saliva freed from bacteria had no such property. It is only fair to state that this result does not accord with the experiments of Sanarelli.

After much time and labor had been expended in this somewhat fruitless investigation of the possible inhibitory action of saliva, attention was directed to the culture material which, in the form of food particles, desquamated epithelium, etc., exists almost constantly in the mouth, and which by alteration in its character or by any increase or diminution in its amount might serve to inhibit or to increase the growth of the three pathogenic forms used in these experiments. It had been observed by other investigators that not only the rapidity of growth but the pathogenic properties of all bacteria depend greatly upon the amount and kind of the culture medium used. That this was true of these mouth forms under consideration was easily determined so far as it applied to growths on artificial media, and the author was encouraged to believe that the same would prove true when they were studied in their natural condition in the human mouth; that is to say, that a form would be more numerous and the virulence would be greater under conditions which favored its growth in the mouth, and that it would become less active and less numerous when deprived of nutrition.

In order to find cases containing the three organisms experimented with a great many patients both in private practice and in the dispensary had to be examined, and many hundred cultures and cover-

glass preparations had to be made. Work was begun with the staphylococcus pyogenes aureus, and although it anticipates the results somewhat, it may be stated that when once found in the mouth this form was more persistent than either of the other two examined. In Case No. 1 it was found in the mouth in great abundance. Several cavities containing pus were discovered in the gum margin around the necks of the teeth, and these pockets contained many aureus forms. Masses were also found adhering to the teeth. Cultures made at this time showed this pus-producing form to be extremely virulent.

It is well known that the subcutaneous inoculation of this bacterium in lower animals does not always produce a suppurative process, and large quantities of a bouillon culture may be introduced into the abdominal cavity without producing inflammation, unless something which acts as a direct irritant be introduced at the same time. When, however, the organism is injected directly into the circulation the results leave no doubt as to its action. For this reason rabbits were used in the present experiment. In one animal 0.2 cubic centimeter of a bouillon culture was introduced into the venous circulation of the rabbit's ear, and in another rabbit inoculated at the same time the same amount of a watery suspension of the organism was used. In the first animal death followed in a little less than three days, and the second animal died about twelve hours later. The appearance displayed at the autopsy of these animals was in every way typical. The pericardial sac was distended by a gelatinous substance, and minute yellow abscesses were seen in the myocardium. The diaphragm and kidneys were studded with these yellow spots; the muscles also showed great numbers of them, but the liver and brain apparently were not affected. Cultures and cover-slip preparations from these minute abscesses left no doubt as to the cause of death. Staphylococcus pyogenes aureus was found in pure cultures.

Treatment was now directed to the patient in whose mouth this organism had been found, and for three weeks the most rigid cleanliness was enforced. The pus pockets were syringed out daily with pyrozone, and twice applications of nitrate of silver were made. Under this treatment a marked improvement was made, although an absolute cure was by no means accomplished. The patient was enjoined to cleanse the teeth after every meal and to remove the

food products as quickly and as thoroughly as possible. This precaution was insisted upon because it seemed reasonable to believe that food particles remaining in the mouth would furnish an excellent medium for the development of bacteria. At the end of three weeks cultures were taken from as nearly as possible the same spot in the mouth as that from which the previous culture had been taken. This was upon the buccal surface of the upper left second molar about an eighth of an inch from the opening of one of the pus-pockets referred to. It is interesting to note that at this time almost all forms of bacteria in this mouth as shown by numerous cover slips were far less numerous than when examinations were made three weeks before. The diminution was particularly marked in the thread-like forms and in the spirilla, but just what significance may be attached to this observation the writer is at present unable to say. The cultures of the aureus made at this time were treated exactly as those taken three weeks before, and showed but slight variations in their development upon artificial media except in one particular. The chromogenic action of the first cultures was much more marked, and the characteristic color appeared slightly earlier than in the later cultures. It is, however, not to be inferred that chromogenic action is any indication of virulence.

Two rabbits of approximately the same weight as those used in the earlier experiments were selected and inoculated as before, care being taken that in every particular the operations should be a repetition of those performed three weeks earlier, the only difference being that in these later experiments the cultures were taken, as has been said, after the mouth had been scrupulously cleaned and treated for three weeks. The animal inoculated with a watery suspension of the organism died at the end of seven days, while the animal inoculated with a bouillon culture survived. In the case of the surviving animal the only symptom noticed, except a slight dullness, was an increase in the amount of urine passed. The autopsy upon the dead animal showed, in addition to the yellow abscesses referred to in the previous case, a somewhat marked peritonitis.

This experiment was repeated with bacteria taken from two other mouths with but slight variation in the result. In Case No. 2 only one animal died of the two inoculated with cultures from the un-cared-for mouth, while both animals inoculated after the mouth had been cared for for a month survived and apparently

experienced no great discomfort. In Case No. 3 both animals died on the fourth day when inoculated with cultures from the unclean mouth, and cultures taken after three weeks' care killed one animal in five days and the other died on the ninth. This case is of greater significance than would appear from a simple statement of results, because, owing to the illness of her child and the poverty of her surroundings, it was almost impossible for this patient to greatly improve the condition of her mouth, and there was little difference in its condition between the first and second inoculations.

Other experiments were made by finding the organism (as is sometimes possible) in a clean, well-cared-for mouth and comparing its virulence with that of the same organism taken from a filthy, uncared-for mouth in which pus-pockets and abscesses abound. These experiments, which will cover a large number of cases, are not yet completed, but sufficient evidence has been accumulated to make clear the fact that the staphylococcus pyogenes aureus is more virulent when taken from filthy mouths than when taken from mouths that receive constant care.

Experiments with the micrococcus tetragenus were much simplified by the fact that guinea-pigs and white mice are quite susceptible and could therefore be used for inoculation. It is interesting to note that gray mice are not susceptible to this bacterium. The organism, as has been said, is almost always found in tuberculous patients and is frequently seen in healthy mouths. Throughout these experiments care was taken not to confound this organism with the micrococcus tetragenus subflavus, which is sometimes found in nasal mucus and which may find its way into the mouth. While the former grows but slowly on nutrient gelatin, the latter does not grow at all on that medium. Other marked differences make it impossible to confound the two except by gross carelessness. It has been said that guinea-pigs and white mice were susceptible to the micrococcus tetragenus, but in the case of white mice death was often delayed until the eighth or ninth day, while in the case of guinea-pigs a local abscess was often the only result of the inoculation. At other times death occurred from general infection. When this occurred, whether in guinea-pigs or white mice, there were few characteristic signs in any of the organs examined at the autopsy. Microscopic examinations of the blood, however, revealed the presence of the organism, and the inoculation of other suscep-

tible animals with a drop of blood or a bit of tissue from the dead animal would reproduce the disease in the animal inoculated.

It was discovered that while the organism under consideration was easily found in the mouths of tuberculous patients, it was by no means as common in well-cared-for mouths as we had been led to suppose. One of the chief difficulties in experimenting with this form was that while it was to be found in fully ten per cent of healthy mouths that did not receive special care—such mouths, for instance, as are met with in dispensary practice—yet in private practice, among people of cleanly habits who carefully brushed the teeth, the organism was by no means common. The writer failed to find it in more than two per cent of the latter cases. Another difficulty encountered was the fact that when discovered in the mouth of one of these dispensary patients, if the patient could be induced to go to the dental dispensary and have the mouth thoroughly cleaned and put in order, and if he could then be persuaded to wash and cleanse his mouth several times a day for a fortnight, the organism would disappear except (as was to be supposed) in the mouth of the tuberculous patient, where its number greatly diminished under careful cleansing of the mouth. The aureus was much more persistent and resisted careful cleansing of the mouth for many weeks; indeed, in some cases it seemed nearly impossible to get rid of it, so tenaciously did it adhere to the teeth and gums.

The following cases will serve to illustrate the variations in virulence of the micrococcus tetragenus under different conditions. Case No. 1 was a tuberculous patient with teeth in good order and a mouth clean and well cared for. Cultures taken from this mouth and introduced into white mice caused death in from three to five days. Of two guinea-pigs inoculated with the same culture, one died in five days, while the other survived but showed local abscess. The organism was recovered in these as in the following cases.

Case No. 2 was also a tuberculous patient, but unlike the first case the mouth was shockingly neglected and contained several badly diseased teeth, while several were missing. Cultures were made as in the previous case, and two white mice and two guinea-pigs were used for inoculation purposes. As a result one white mouse died in two days and one in four days, while one guinea-pig died in five days and the other survived until the ninth day, when he died from a mixed infection. The micrococcus seemed slightly

more virulent in this case than in No. 1, but the difference was hardly great enough to be significant. This mouth was thoroughly cleaned, the abscessed teeth extracted, and the patient instructed to cleanse the mouth thoroughly several times a day. This she did faithfully for two weeks, and cultures were again taken and inoculations made as before. There was no perceptible diminution in the virulence of the cultures, the animals dying in about the same time as when the culture was taken from an unclean mouth. Cover-glass preparations showed a great reduction in number of nearly all forms of bacteria after the mouth had been carefully cleaned for a period of two weeks. It was regretted that this case could not be watched for a longer period, but the patient was ordered to seek another climate, and the case was lost to sight.

Case No. 3 was a patient in good health, with a clean, well-cared-for mouth. There were few coccus forms present, although a number of rod forms, both straight and curved, could be seen in cover-glass preparations. The culture was obtained early in the morning before the mouth was cleansed. Many previous attempts to obtain cultures from the micrococcus tetragenus from this mouth had failed. Following inoculation, one white mouse died in six days and one in seven. Both guinea-pigs survived. One had an abscess at point of inoculation, but the organism could not be recovered from this animal. Inoculations were made from the same culture five days after the first inoculations were made. In this second series only one white mouse succumbed and that at the end of the seventh day. The virulence of the organism grows less the longer it is grown on artificial media. It increases by being passed through susceptible animals.

Case No. 4 was from the mouth of a patient who was suffering from several abscessed teeth, and whose mouth was in a totally uncared-for condition; otherwise he was in excellent health. Many coccus forms were present in the mouth. The tetragenus form was isolated and the usual inoculations were made, with the result that one white mouse died in four and one in five days. Both guinea-pigs died on the seventh day.

Case No. 5, the patient who figured in Case No. 4, was induced to carefully cleanse his mouth, paying especial attention to his tongue and teeth. His teeth were properly treated and put in fair order. Eighteen days after this treatment had begun, and the same

number of days after the first culture was taken for inoculation (Case No. 4), the attempt was made to find the organism. Eleven cultures were made from different parts of the mouth, and the bacterium was found in two only. One of these was taken from the crypt of the tonsils and the other was taken from the gum surrounding one of the dead teeth that was still undergoing treatment. Inoculation with the culture taken from the tonsils caused the death of one white mouse on the seventh day. The second mouse escaped from the cage on the fourth day and could not be recovered. One guinea-pig died on the fifth day from a mixed infection, while the other survived. Inoculation of mice and guinea-pigs from the culture taken from the neighborhood of the diseased tooth was not fatal in any case.

Many other cases were studied, and these would perhaps be of interest to the student of bacteriology, but enough has been said to point to the following conclusions: That the micrococcus tetragenus is more active when taken from the mouth of a tuberculous patient than from the mouth of a healthy person. That cleansing the mouth in tuberculous patients greatly lessens the number, while it does not always lessen the virulence of this bacterium. It is possible that a longer period of cleanliness might give a more favorable result. In mouths of healthy individuals this organism occurs with greater frequency and in greater numbers, and is much more virulent when the mouth is neglected than when it is habitually well cared for. The organism will usually disappear from a mouth in a few weeks if the mouth is properly cleansed several times a day during that period. This does not apply to tuberculous cases, although, as has been said, a reduction in the number is usually effected by cleansing.

The micrococcus lanceolatus is variously described under many names, as, Diplococcus pneumoniæ (Weichselbaum); Streptococcus lanceolatus pasteuri (Gameleia); Bacillus salivarius septicus (Biondi); Micrococcus pneumoniæ crouposæ (Fränkel); etc. It is found in the saliva in many diseased conditions, as its variety of names would indicate, but it also occurs in the saliva of healthy individuals, and this saliva is often fatal to small animals. Sternberg called attention to this bacterium, which he discovered in the blood of rabbits which had been previously inoculated with saliva from his own mouth. About the same time (1880) Pasteur found it in the saliva of a child suffering with hydrophobia. A number of other

writers have made numerous experiments with this organism, and their results may be summed up by saying that it is not constant in the mouth, but appears and disappears as if by accident, and that saliva containing it varies in virulence under different conditions.

It was necessary to make but a few experiments to demonstrate a fact which had been already pointed out by Sternberg and others, that micrococcus lanceolatus loses its pathogenic property to a marked degree when it is grown on artificial media. It is also more easily destroyed by antiseptics than most bacteria, and its growth is retarded and its virulence lessened by antiseptics which are not powerful enough to completely destroy the organism. Its pathogenic properties are quickly revived by passing it through susceptible animals. Emmerich in 1891 demonstrated the immunizing action of this bacterium, and in the writer's experiments it was found that an animal once inoculated with this organism without fatal result was thereafter immune to very large doses. How long the immunity lasts has not been ascertained.

It was therefore to be expected that mouth cleanliness would cause a disappearance of this microbe in many cases, and this the writer found to be true. It is probably the easiest of all pathogenic mouth forms to get rid of. Absolute cleanliness of the mouth, including tongue and teeth, with the frequent use of an antiseptic mouth-wash, would in a majority of instances cause the entire disappearance of this bacterium in from three to fourteen days. The same treatment, when it did not actually destroy the microbe, would render the saliva which contained it *non-pathogenic*, provided the saliva itself was normal. A further physiological and chemical study of saliva secreted under various conditions of health will probably throw light on the question of its action in encouraging or retarding the growth of bacteria. In the present experiments the writer was unable to enter into the study of that phase of the question, but it was observed in a general way that saliva which was clear and watery offered less encouragement to the development of bacteria than that which was thick and viscid and which apparently contained large quantities of mucus and broken-down epithelial cells.

If it be true, as can now be scarcely doubted, that this microbe is the excitant of croupous pneumonia, it is undoubtedly true also that the infection is derived from the mouth in a vast majority of cases.

We have then a most important factor in preventive medicine in mouth cleanliness, and it can be asserted with a degree of positiveness that is fully borne out by experiments and by clinical experience, that this disease might be almost eliminated from human ills were it possible to keep the mouth in a clean, healthy condition. This, we know, is impossible. People can not be persuaded, except possibly when the disease is exceedingly prevalent and the danger from exposure is imminent, to spend the time necessary to guard against the likelihood of mouth infection, but there is another aspect of the question which will certainly appeal to the physician anxious to prevent disease.

It is well known that croupous pneumonia frequently follows other diseases. It is one of the dreaded sequelæ of measles, whooping-cough, and typhoid fever, and appears to develop sometimes from a severe cold. This, we know, is not strictly true, for it is not possible for one disease to turn into another, since the characteristic pathogenic properties of a given bacterium do not depart greatly from well-defined lines. It is, however, true that a system disordered by what we term a cold, or having its resisting power lowered by one disease, is peculiarly susceptible to the attacks of another; and, as in the case of croupous pneumonia, if the microbe of the disease is lurking in the mouth it finds the system peculiarly susceptible to its attacks after one of the aforementioned diseases has lowered the vitality of the patient.

Many physicians now recognize in a degree the importance of cleansing the mouth, and the educated nurse, if she be a careful woman, will regularly brush her patient's teeth, because she has found that this simple act greatly adds to his comfort. Yet it is true that comparatively few physicians or nurses have learned to look upon cleanliness of the mouth as an important factor in preventing complicating diseases. If, however, the experiments presented have not been wrongly interpreted, the pneumonia germ is one of the easiest to destroy, and mouth cleanliness will go far to reduce the disease to a minimum. If diphtheria and other pathogenic forms which find their way into the mouth are influenced by the conditions which have been shown to affect the virulence of the bacteria experimented upon, then thorough mouth cleanliness will be found to be our greatest safeguard against disease.—*International.*

CANCER OF THE TONGUE. By Herbert Smale. Cancer or epithelioma of the tongue is most commonly found on the side of that organ, rather nearer the tip than the back, although occasionally occurring on the dorsum. The ulcers usually found on the dorsum are of syphilitic origin. By far the largest number of cases of cancer occur between the ages of 40 and 60, being fairly evenly distributed over that period. Cases, however, have been recorded in which it has occurred in people as young as 25, and one or more cases have been published in which it has occurred in individuals over 75. It more frequently occurs in men than women. I have never seen a case of epithelioma of the tongue in a woman, although I can recall at least a dozen occurring in men.

Irritation of the epithelium covering the tongue is the cause of this disease, and from whatever source it arises, such as excessive smoking (especially where a short clay pipe is used, when the teeth often become notched by holding it), the presence of a carious tooth, or even one not decayed, with a sharp edge, spirit-drinking, and the use of caustics in patients above the middle decade of life, are all given as local causes. In connection with the use of caustics, Henry Butlin in his book on diseases of the tongue says, "If there be one thing more harmful than another in the treatment of simple indolent sores and affections of the tongue in persons over thirty years of age it is the application of a strong caustic."

When the tongue has become irritated by whatever means there is a proliferation of the epithelial cells, and consequently a down-growth of epithelium, which displaces the tissues it comes in contact with; but until it has passed through the basement membrane the proliferation of cells cannot be called an epithelioma, and it is only by making a microscopical section that it can be determined in an early case whether it be an epithelioma or not.

The following are a few points in the differential diagnosis between an epitheliomatous ulcer and a gummatous ulcer. An epitheliomatous ulcer usually occurs in patients over 40 years of age, there is often present some distinct cause of local irritation, the ulcer is more often situated in the margin of the tongue, the edges are raised, firm, nodular and everted, the base is irregular and tuberculated; very rarely there is more than one ulcer, induration follows ulceration; lymphatic glands are always involved if the ulcer has lasted some weeks. Frequently some chronic epithelial thickening, such as

leucoplakia, precedes the ulcer, or is situated on other parts of the tongue; the ulcer is of irregular shape, the secretion foul and free. The tongue is immovable and fixed, speech and swallowing become difficult, there is rapidity of growth with extreme pain shooting towards the ear.

With a gummatous ulcer the patient is often much younger, no distinct cause of local irritation can be seen, the ulcer is more often situated in the middle line of the tongue. The edges are soft and undermined, while the base is covered with a wash-leather slough; the ulcers are very often multiple, induration precedes ulceration; the lymphatic glands are rarely involved, usually a distinct syphilitic history can be obtained, the secretion is less foul and smaller in amount, the ulcer is roundish in shape, the tongue is freely movable, speech and swallowing are little affected, there is very little pain, and anti-syphilitic treatment is soon curative.

The mode of onset of an epithelioma varies somewhat. It arises most commonly as an ulcer at the margin of the organ towards the junction of the middle and posterior third, and is then probably due to irritation caused by ragged or irregular bicuspid or molar teeth. It may start in a crack, fissure or cicatrix on the dorsum of the tongue, as a result of a chronic superficial glossitis, or of a preceding gumma. It may commence as a wart-like growth, the base of which becomes infiltrated, the tumor invading the muscular substance and spreading to the root of the tongue. It may originate as a submucous infiltration, starting as an ingrowth from the mucous membrane, without much external manifestation of its presence. It may first be noticed as an irregular ulcer in the floor of the mouth. It sometimes spreads into the tongue from surrounding parts such as the tonsil and larynx.

It therefore behooves us all as members of the dental profession to be always on the lookout for any of these numerous ways in which this deadly disease may commence. We as dentists have the privilege to a certain extent over general practitioners in being able to thoroughly examine the mouth at the same time that we inspect the teeth, and for this reason if for no other we should all be most observant.

In whatever way it starts, the features soon become manifest. A new growth is noticed, hard in consistency, indefinite as to its extent, which may or may not be painful from the first, and which

ulcerates superficially, exposing a more or less crateriform cavity with a gray foul surface, readily bleeding when touched, and discharging a foul secretion which causes extreme fetor of the breath.

The ulcer is surrounded by an indurated mass, which gradually shelves off into the neighboring healthy structures, or may be abruptly limited; profuse salivation is produced by the irritation of the branches of the third division of the trigeminal nerve, and all movements of the tongue are painful and limited on account of the infiltration of the base; so that as both swallowing and speech are difficult the patient allows the saliva to dribble out of his mouth. The pain is often excessive and usually extends along many of the branches of the fifth nerve, especially to the ear, so that sleep becomes impossible, and the patient's condition steadily and rapidly deteriorates.

The glands under the chin and at the angle of the jaw early become involved in the disease, which ultimately attacks the glandulæ concatinatæ. These secondary growths are very frequently cystic in character from the degeneration of the masses of epithelium formed within them, after a time they approach the surface and burst, leaving ragged, malignant ulcers in the neck. The lower jaw, moreover, is often invaded in the later stages of the disease.

The occurrence of the typical cachexia is determined not only by the pain and consequent sleeplessness, but also by the inability to take sufficient nourishment, the absorption of products of putrefaction swallowed with the saliva, the excessive salivation, the occasional hemorrhages and the extent of the secondary growths. The patient rarely lives, apart from treatment, for more than twelve months after the disease has been first noticed.

When a case is met with where the ulcer is situated on the side or base of the tongue, in a patient over 45 years of age, with the typical enlargement of the glands, profuse salivation and impaired movement, there can be little doubt as to the diagnosis. But such plain, straightforward cases as these do not as a rule come within the domain of the dentist, but when it is seen in an early stage, as an infiltration of a syphilitic fissure or cicatrix, or as a small wart, it may be exceedingly difficult to determine whether it be malignant or not. The early enlargement of the glands, the amount of fixation of the organ, the pain and infiltration of the base of ulcer, are all points that must be well considered.

In all cases where doubt exists, a small portion of the suspected area should be removed under cocain and submitted to careful microscopical examination, and thus its nature be ascertained. Here again you will see how a dentist can never be too observant when examining a mouth, and how useful it may be to him to be conversant with the use of the microscope, and also the various ways of hardening, staining in bulk or section, and mounting a microscopical specimen which he has in this way removed.

The administration of steadily increasing doses of iodid of potassium will generally bring about rapid improvement in a syphilitic case, but will do no good to an epithelioma, except perhaps temporarily where the two diseases are coexistent. The only hope of curing the patient lies in thorough and early removal of the growth, which, it must be remembered, has probably extended much further than one expects; hence no half measures should be adopted, but complete operations, often including the lymphatic areas, are desirable. Mr. Jonathan Hutchinson has recommended in all early doubtful cases that the growth should be removed well outside its margins, even though the glands be not affected. If on examination it should be proved that the growth is innocent, no permanent injury has been inflicted on the organ; while, should it be malignant, the patient will be greatly benefited and his life probably be saved for many years. The presence of a wart on the tip or side of the tongue should make the dentist suspicious, and he should advise the patient at one to seek skilled assistance, with the object of its early removal.

Recently an interesting case of epithelioma of the tongue presented to have the teeth scaled. The patient, a man 55 years of age, said that he had noticed a swelling in his mouth for six months. On examination, the mouth was found in an insanitary condition. On the left side of the tongue, about half way between the tip and root, was seen a large ulcer, the edges of which were everted; the surrounding tissue was very hard, the base indurated, no enlarged glands could be felt in the neck. The patient had never smoked in his life. He subsequently returned to the hospital, where a modified Whitehead's operation was performed. The whole organ being removed, enlarged glands were carefully sought for, but could not be found. The patient when last seen was making a good recovery.—*Record.*

EXOSTOSIS, WITH LOSS OF TOOTH. By George T. Baker, D.D.S., Boston. In November, 1897, Miss C., aged thirty-nine, experienced very severe pains in the left superior maxillary region. The pain usually began about six o'clock in the afternoon and lasted until bedtime. While very severe, it was not sufficiently localized to enable her to state exactly where it was, but it seemed to be in the vicinity of the upper left bicuspids or molars. This pain continued every day for two or three weeks, and she supposed it to be "neuralgia." At the end of the third week it disappeared without treatment, and complete immunity was enjoyed until the beginning of August, 1898, a period of about nine months. It then began, more severe than before, generally commencing at bedtime and continuing two or three hours, when patient would sleep and rise in the morning free from pain. October 1, 1898, she consulted me regarding it, stating the above facts, and adding that she was very anxious to save all her teeth, and hoped that not even one would have to be sacrificed.

On examination, nothing was found in the mouth to account for the unusual condition, except that the upper left second bicuspid contained on its occluso-distal surface an oxyphosphate filling partially dissolved. The gum of normal appearance was apparently healthy, but this tooth alone seemed to respond somewhat to gentle tapping. Believing that this tooth was the cause of the long-continued disturbance, the partially dissolved filling was removed and the bur carried through the thin layer of dentin directly into the pulp-chamber, with but very little pain and slight hemorrhage. Suspecting pulp-nodules, arsenic was applied, one-fiftieth of a grain, with an equal quantity of sulphate of morphia, and enough camphophénique to make a thin paste. This was allowed to remain in the tooth for one week, during which time patient experienced no trouble. A broach was then passed to the foramen and a thin ichorous fluid was discharged, but the suspected pulp-nodules were not found.

A few days later the pain again returned, and, hoping to break up a possible pus sac, a drill was passed through gum and process to the end of the root. Thinking that this would give relief, the patient was dismissed, but next day, reporting no abatement of the pain, the tooth was extracted and very extensive exostosis was found extending all over the upper half of the root, causing the tooth to appear larger at the apex than at the neck. There was some discom-

fort for about twenty-four hours, after which the pain ceased. Nearly all the other teeth are in position, and no other has been similarly affected up to the present time, now over five years.

In conclusion, attention is called to the salient points of this case, which may possibly be of help in diagnosing other similar cases: 1. Intermittent character of pain, with paroxysms at night and immunity during the day. 2. Absence of all external indication of trouble, such as swelling, inflammation, or marked sensitiveness to heat or cold. 3. Inability of patient to localize the pain, even when so severe as to banish sleep. 4. Crown of affected tooth had been broken away, so that there was no occlusion with lower teeth.—*International.*

NATURE'S METHOD OF OBTUNDING PAIN. It is generally supposed that pain in inflammation is due to pressure on nerves by the exudate poured out. This explanation does not agree with the facts. Hot baths, hot sand and hot air relieve pain enormously in many chronic inflammations, and yet, according to Bier, they act by exciting a high degree of arterial hyperemia. The arterial hyperemia produced by Bier's method increases pressure but relieves pain. The same relief of pain was obtained by Ritter in treating a case of frost bite by artificial hyperemia. Schleich's method of local anesthesia by infiltration increases pressure. Ritter finds that in all acute inflammations the power of perceiving pain increases quickly, but that as soon as serous infiltration (edema) appears in the tissues it markedly diminishes. These observations apply to traumatic as well as to infective inflammations. Even in inflammation of the skin, e. g., erysipelas, there is at first increased perception of pain, but later, when the tissues are tensely infiltrated, the pain perception is lowered. Ritter carried out a series of experiments on himself, producing artificial hyperemia and inflammation. He found that hyperemia, whether produced by bandages or cupping, always diminished the perception of pain, while inflammatory arterial hyperemia increased it to begin with, but as soon as exudation was established the pain diminished. Inflammatory edema is comparable to the wheals produced by the Schleich injections, which immediately occasion pain, later anesthesia. Baum believes that the anesthetic effect of Schleich's solution depends on the osmotic tension of the fluid used; this may be the explanation

of the phenomena observed in inflammation. By determination of the freezing-point of fluids obtained from inflammatory swellings, Ritter found a distinct increase of the osmotic pressure, compared to that of the normal tissue fluids. Normally the concentration of the tissue juices varies according to the destruction of the albumin in metabolism, and Ritter points out that in the various forms of inflammation there is an increased destruction of albumin (necrosis of tissue). In all probability it is due to an increased destruction of albumin that the juices in inflammatory exudates are of high tonicity. The conclusion is evident that the pain in inflammation is not due to the pressure of exudates, but to their increased concentration. Anesthesia rapidly follows the early pain. This anesthesia is not desirable because it is often a source of danger to the tissues, as a complete anesthesia is equal to death of the affected cells. The body does not submit passively to the increased concentration of the inflammatory fluids, but endeavors to prevent or dilute them. This dilution is obtained by osmosis, the blood and serum flowing toward the fluid of high osmotic tension. Ritter has observed, contrary to former investigations, that every chemical injected into the skin produces a hyperemia in the neighborhood. The stronger the concentration of the chemical the greater the hyperemia or serous infiltration. When isotonous fluids are used the influence of hyperemia on the sense of pain is proved by the injection of normal salt solution, which produces neither hyperemia, pain nor anesthesia. From this investigation it follows that one must consider hyperemia (whether arterial or venous) and serous infiltration nature's method of alleviating pain by lowering the injurious high concentration. Normally this method of alleviating pain acts very promptly, but in severe injuries and in the anemic it is often delayed. Under such circumstances one may artificially produce or increase it (1) by all so-called counterirritants (according to Ritter, it is impossible to produce an inflammatory hyperemia without injuring the tissues); (2) the most effective and least injurious means is that suggested by Bier, artificial stasis, cupping, Junod's boot, and hot air.

ONE OF THE COMPLICATIONS OF ANESTHESIA (ASPHYXIA). Thos. L. Bennet (*Medical News*) does not use the word asphyxia here in its literal sense alone, of death through the

respiration, but rather denoting the condition produced by a lessened percentage of oxygen, or an increased percentage of carbon dioxid, or both, in the blood. This state is produced in a number of ways during the administration of anesthetics: (1) By the simple exclusion of oxygen, as in the inhalation of pure nitrous oxid, or highly-concentrated ether vapor. (2) By paralysis of the respiratory center from over-narcosis, producing failure of the respiration. (3) By the production of a condition, the exact nature of which is unknown to the writer, in which cyanosis is marked, notwithstanding free respiration, and no exclusion of oxygen. This most frequently complicates the administration of chloroform, and is usually associated with some circulatory depression. Close observation has led the writer to believe that it is due either to a paralyzing effect of the anesthetic upon the blood-corpuscles, suspending their function of carrying oxygen and carbon dioxid, or to failure of the pulmonic circulation, this, in turn, being due to depression of the cardiac and vasomotor mechanism, or to paralysis of the walls of the pulmonic vessels, resulting in such inefficiency of the lesser circulation that proper aeration of the blood is not accomplished. (4) Asphyxia complicating anesthesia is most often produced by mechanical obstruction to respiration, resulting from (*a*) narrowing of the air passages from within, *e. g.*, from tuberculosis, carcinoma, etc.; (*b*) narrowing of the air passages from without, from pressure; (*c*) other forms of pressure upon the respiratory organ, *e. g.*, tympanites; (*d*) diseases of the lung limiting respiratory capacity; (*e*) certain positions required in the operation; (*f*) certain operative manipulations which interfere with respiration by distortion, etc.; (*g*) foreign bodies in the air passages; (*h*) stertor and stridor; (*i*) a short, thick neck, or a long, thin nose may act as an obstruction. The treatment of asphyxia under these circumstances is the least part of the subject. The patient must not suffer from deprivation of oxygen, nor breathe an excess of carbon dioxid, nor have his respiration obstructed. An open air-way should be maintained. Anesthesia by nitrous oxid alone or mixed with air or with oxygen is the form of anesthesia most often complicated by asphyxia. This is the chief risk of the administration, and patients who should not be exposed to this risk should have some other anesthetic. Whenever a certain degree of asphyxia necessarily complicates anesthesia it may be relieved by the administra-

tion of oxygen throughout the narcosis. Excessive asphyxia calls for such measures as pulling forward the tongue, artificial respiration, intubation or tracheotomy. The last should not be too long delayed.

PREDISPOSING FACTORS OF LOCAL INFECTION. By Geo. W. Cook, D.D.S., Chicago. Read before the Minnesota State Dental Association. Respiration is the sum total of the processes by which protoplasm gains oxygen and gets rid of the carbon dioxid it produces as a result of its activity. In the multicellular organism, as in the higher animals, it includes all those processes by which the ultimate elements (cells) of the body gain the oxygen necessary to maintain life phenomena and get rid of the carbon dioxid (C_2) resulting from life phenomena.

In the higher animals special arrangements are necessary for the carrying out of these processes, viz., the organs of respiration. In so far as the work of the special organs of respiration is concerned the processes are *mechanical* and *physical.* The trachea (windpipe), which communicates with the external air through the nose and mouth, divides below into innumerable branches which end in bronchioles, each bronchiole breaks up into several wider passages or infundibula, the walls of which contain pockets or alcoves (alveoli or air-cells). The walls of the alveoli or air-cells consist essentially of a network of elastic fibers continuous with a similar layer in the infundibula and bronchioles, and are covered on the side next the lumen or outer side by a single layer of large, clear epithelial scales or cells.

The quantity of blood which traverses the lungs bears no relation to the amount required for their actual nourishment. This blood is not derived from the devitalized (?) blood of the right ventricle, but is obtained directly from the aortic system by the bronchial arteries and is returned by the bronchial veins into the venous system. *This blood supply to the lungs has nothing to do with the processes of respiration.* The venous blood sent out from the *right ventricle* through the pulmonary artery, which artery breaks up into innumerable branches, forming a dense capillary network around the alveoli or air-cells, and finally forming the pulmonary veins, has nothing to do with the nourishment of the lung tissue, but is wholly concerned in the act of respiration.

From this short description of the lungs one can readily under-

stand the *mechanical* part of the organs of respiration. The mechanical part is simply (if it were spread out) a thin membrane consisting of a single layer of epithelial cells on the air side, and a dense capillary network of blood vessels on the inner side, and is merely a mechanical device for bringing the oxygen of the air in contact with a large surface of a diffusible animal membrane.

The *physical* part of respiration consists in the well-known physical phenomena of the diffusion of gases, whereby gases will pass through animal membranes according to the law of the partial pressure of gases. Here the oxygen of the air passes through the single layer of epithelial cells into the blood, and the CO_2 which is held under pressure by the blood passes in the opposite direction into the alveoli of the lungs. This comprises what is usually called external respiration. CO_2‡°.

Internal respiration, or the interchange of the oxygen taken up by the blood and lymph in the passage through the lungs on the one hand and the cells of the body on the other hand, is not a physical process, but is more properly a physio-chemical process. Here the cells of the body take up oxygen from the air, not according to any physical law, but a chemical union is formed and gives off CO_2 to the blood, not according to any physical law of diffusion of gases, but according to the laws of the disassociation of chemical compounds. Here comes in a very important as well as a very complex biological chemical problem. Oxygen diffuses into the blood and lymph. An unstable chemical compound is formed with the oxygen and the blood proteids called oxyhemoglobin (HOO).

The cells of the body have the power to disassociate the oxyhemoglobin (HOO) compound and appropriate the oxygen, and leave behind reduced hemoglobin which has the power to unite again with the CO_2 of the cell, forming carbon dioxid hemoglobin (CO_2HO). So internal respiration consists of a double chemical reaction between the oxyhemoglobin of the blood and the cells of the tissues. This action is brought about or stimulated by the "contact action" (fermentation chemical processes) of the living animal cell. As in all chemical actions an equilibrium is maintained, that is, the chemical reaction never goes on to its ultimate end, but goes only to a certain point where the new chemical compounds formed begin to change the conditions under which the *primary chemical* action began, and thus stop the further progress of the action or cause it to revert to

its former condition. This phenomenon is especially common in the chemistry of fermentation, or the chemistry of living organisms which have the power to disassociate chemical compounds. It is no doubt true of all chemical reactions. For example, we might mention the action of diastase in plant physiology. Diastase is a constituent of the germinating part of all seeds. When it comes in contact with starches it produces the following change: Starch $2(C_6H_{10}O_5)a+aH_2O+Diastase=aC_{12}H_{22}O_{11}$ maltose. But all the starch is not changed to maltose or dextrose, only a certain per cent. When the maltose or dextrose accumulates to a certain point it changes the condition of the solution so that the diastase acts no further, and if increased beyond this point it has a tendency to revert to starch again. This is one of the great principles of living chemistry and is so imperfectly understood at present as to render it impossible to express our ideas clearly on the subject.

We shall try to see how the same principles apply to the phenomena of digestion. *Digestion* in the widest sense is the sum total of the processes by which the *foodstuffs*, as taken from the plant and animal, are prepared for absorption and their further *fate* in relation to the chemical changes of the tissues and their excretion as waste products by channels other than the lungs.

In the higher animals we have special organs to carry on external respiration; in like manner we also find special organs for the process of *external digestion*. By external digestion we mean those chemical changes induced in the *foodstuffs* by means of *ferments* or *enzymes* necessary for their absorption or passage into the body proper. The special organ for the carrying out of these processes is the alimentary canal; just as the lungs are the special organs for carrying on the mechanical and physical part of *respiration*. The alimentary canal is a muscular tube which begins at the mouth and runs under various names, viz., pharynx, esophagus, stomach, small and large intestines and rectum, and ends at the anus. It communicates with the external world at both ends, and its lumen is in no wise inside of the body.

Body cavity.

Mouth. Alimentary canal. Anus.

Body cavity.

Therefore all chemical changes in the *foodstuffs* which take place in the alimentary canal are outside of the body, hence the term *ex-*

ternal digestion. As the lungs are simply an apparatus to facilitate the interchange of gases between the external air and the internal fluids of the body, so the alimentary canal is simply an apparatus in which such chemical changes in the foodstuffs can be brought about as to facilitate their passage through the intestinal walls into the body proper. These changes are purely chemical and are brought about through the agency of ferments or enzymes. These are bodies found in all plants and animals, which by their presence or contact with other chemical substances are capable of inducing certain chemical changes in the bodies with which they come in contact without themselves being changed. Also the amount of the change is wholly out of proportion to the amount of the enzyme acting, so that a small quantity of the ferment may change a large quantity of the foodstuff acted upon.

Thus we find all along the alimentary canal glands which secrete these enzymes; each different enzyme produces its own specific chemical change. The common action of all these ferments is to disassociate or bring into solution the foodstuffs so that they may pass through the walls of the intestinal canal, for the physical forces, diffusion and osmosis, can act only when substances are in solution, and these forces are called into play in the processes of absorption. The first of these enzymes we meet with in the intestinal tract is contained in the secretion of the salivary glands and is called ptyalin. It is a non-organized ferment, i. e., it is the product of living cell, but has no living properties itself. Its specific action is on the food principle commonly called "carbohydrate."

A similar ferment is also secreted by the pancreas and in the enteric juice of the intestines, viz., the maltose, lactose and invertin, all of which have the power to convert starch into maltose and dextrose, in which form the starches are absorbed. The following equations will illustrate the process, which is essentially one of hydrolysis: $(C_6H_{10}O_5)n$+ptyalin, maltose, lactose or invertin=(Starch) $(C_{12}H_{20}O_{10})54$.

(Insoluble) (Amidulin or soluble starch).

$$\left(\begin{matrix}(C_{12}H_{10}O_{10})54+3H_2O\ \text{(enzymes)}\\ \text{Amidulin or soluble starch.}\end{matrix}\right)=\left(\begin{matrix}(C_{12}H_{20}O_{10})17C_{12}H_{12}O_{11}\\ \text{erythrodextrin.}\end{matrix}\right)$$

$$3\left(\begin{matrix}(C_{12}H_{10}O_{10})17\ C_{12}H_{22}O_{11}\\ \text{Achrodextrin.}\end{matrix}\right)+6H_{20}\ \text{(enzyme)}=9(C_{12}H_{20}O_{10})5$$

$C_{12}H_{22}O_{11}$

$$9(C_{12}H_{20}O_{10})5\ C_{12}H_{22}O_{11}+45H_{20}\ \text{(enzyme)}=54C_{12}H_{22}O_{11}\text{Maltose.}$$

All these changes are due to the taking up of water. In the form of maltose all the carbohydrates are taken into the body and appropriated by the cells of the body. It is one of the diffusible forms of sugar.

In like manner the next great food principle is dealt with, viz., the proteids or albumens. The digestion of the albumens takes place in the stomach and small intestines. Here the chemical changes are induced by the pepsin of the gastric juice, aided by HCl also of the gastric juice, and the trypsin of the pancreatic juice. The former acts best in an acid media, the latter in an alkaline media. While we cannot trace these changes so accurately as we can the digestion of the carbohydrates, owing to our lack of knowledge of the chemistry of the proteid molecule, the whole change seems to be one of solutions. That is, under the influence of dilute HCl and pepsin, colloids, such as are represented in plant and animal proteid matter, are transformed from the solid gelatin state to the semi-solid hydrogelatin and finally to the state of solution. In this latter state they readily pass through the intestinal walls into the body.

If we place some solid fibrin in a 0.2 per cent HCl and add a little pepsin and keep it at a temperature of 40° C. the fibrin soon swells up and becomes translucent and then passes into complete solution. The steps seem to be as follows: Albumen, acid albumen, albumoses, and peptones. In the presence of the trypsin of the pancreatic juice the results are the same, viz., peptones, except that trypsin is capable of splitting up the peptone into amido-acids, viz., leucin $C_6H_{11}(NH_2)O$ and tyrosin $C_3H_4(C_6H_4OH)NH_2)O_2$. Here we have the successive steps: Albumen, alkali albumen, albumoses, peptones—(leucin-tyrosin). The chemistry of these two processes, peptic and trypsic digestion, is one of electric disassociation of the proteid molecule with the taking up of water in each case. This disassociation is carried on to complete solution or to the peptone stage. This principle was demonstrated by Hardy and also by Matthews in their work on the disassociation of colloid cells in the presence of dilute alkali and acid. It is further shown that bacteria have a similar liquefying influence on colloid substance.

The third food principle, viz., fats and oils, is dealt with in like manner by being split up into glycerin and their respective fatty acids and as such pass into the body.

So much for external digestion or the processes by which the body,

by means of self-secreted enzymes, reduces the foodstuffs to a state of solution fit for absorption, just as some forms of bacteria reduce gelatin to a state of solution by its enzymotic action.

Internal digestion like respiration is the interchange between the products of external digestion after they have entered the blood and lymph and the individual cells of the body. The processes here are somewhat the reverse of what takes place in the alimentary tract. In the tissues the liquefied colloids of intestinal digestion are again built up into tissue substance. The maltose and dextrose of the starches are partially stored in the body as glycogen $(C_6H_{10}O_5)n$ and the glycerin and the fatty acids are again united as triglycerites. The parts that are not used to restore body tissues are further broken up into CO $(CH_2)_2$ (urea) and CO_2 as the result of work. So here again, just as in respiration, the interchange results in waste substance which in the case of respiration is CO_2 and in the case of internal digestion CO CH_3) NH_3 CO_2 and H_2O.

Thus we must conclude that all digestion is a chemical process due to the self-secreted enzymes of the body. No outside agency is necessary. But such a normal condition of affairs cannot exist. The earth is full of microorganic life. Nature is full of bacteria of all kinds, many of which have a similar chemical action to the animal ferments, i. e., they can split up chemical compounds into various other substances. As for example, certain fungi, as the yeast, can change glucose $C_6H_{12}O_6$ into alcohol C_2H_6OH. $C_6H_{12}O_6 + \text{yeast} = 2C_2H_5OH + CO_2$. Also by the action of bacteria on solution of carbohydrates lactic acid is formed, and fats are in a similar manner split up into fatty acids and glycerin. This action on fats is commonly spoken of as butyric acid fermentation. Further, by the action of bacteria on proteid matter all kinds of ammonia compounds may be formed, some of which are very poisonous, viz., putrocin, cadaverin, tyroleucin, etc. These products are chemical bodies termed ptomains or toxins.

As the intestinal canal communicates with the external world it is necessarily more or less full of bacteria, most of which are harmless, but their presence must in part be looked upon as an unavoidable evil which the individual must endure, and the evil effects of which must be contended against. Proteid matter, and especially the products of intestinal proteid digestion, form a most favorable media for the growth of these bacteria, and consequently for the

elaboration of these toxic products. Among the more important bacterial products in the intestines might be mentioned certain amido-acids, as phenol, indol and skatol and also tyrosin. These are all absorbed and unite with the sulphuric acid of the body and are finally excreted by the kidneys as conjugate sulphate.

Besides these, numerous ammonia compounds may be formed. Bacteria also acts upon the fats in the intestine and form certain fatty acids, viz., butyric acid, which is the acid of rancid butter, also lactic and propyonic acids are formed by bacteria in the stomach and especially in the mouth. All of these are not only unnatural, but also hurtful when absorbed into the body. Aside from the mouth, the large intestine is a most favorable haunt for bacteria which act upon the feces, forming aside from CO_2 and CH_4 many sulphur and phosphorous combinations with nitrogen which also are absorbable.

When noxious gases CO_2, CO_1, NH_3, SO_2, etc., are inhaled by the lungs they enter the blood and internally act deleteriously on the body cells, upsetting the normal processes of respiration; so also these bacterial intestinal products when absorbed may act in a similar manner on the body cells, hindering the normal processes of internal digestion, and often by their irritating action produce inflammatory changes in the tissues. These symptoms produced by the absorption of these products have been termed autointoxication or sickness originating from within. But this conception is a misnomer. If gases of bacterial origin emanating from a cellar are inhaled they may cause sickness, but it would hardly be an autointoxication; so bacterial decomposition products originating in the intestines and absorbed may and often do cause disease, but such a sickness is not from within. Many bacteria form specific products, as, for instance, the lactic or butyric acid bacillus or the bacteria-forming indol or phenol. When butyric acid is absorbed it produces specific symptoms, or when phenol is absorbed it also produces a specific set of symptoms, just as the diphtheria germ may invade the throat of a child and elaborate a toxin setting up a specific disease or set of symptoms. Hence we have the specific nature of infection or disease, which in all cases is determined by the specific chemical toxins elaborated by the bacterial cause.

The animal body is naturally bacteria-free or sterile. Aside from traumatisms or injuries inflicted by mechanical, chemical or thermal forces, we might define disease as the interchange between the tissue

cells on the one hand and the bacterial decomposition products on the other, provided the bacterial toxic substances accumulate to such an extent as to hinder the normal interchange of the tissue cell with the normal external digestion products of the self-secreted enzymes. These conditions are general, that is, the body as a whole is acted upon. But secondary to these general abnormal conditions we find many local affections, as local ulceration in the mouth and especially around the teeth. In fact, local lesions very often follow general infection from the alimentary canal. We cannot get around the fact that in biology we have two forces acting, one the normal force inherent in the individual by means of which he maintains his equilibrium with his external environments. This equilibrium is maintained through the processes of digestion and respiration. All absorbable products not the result of self-secreted zymotic digestion are foreign to the individual and necessarily detrimental. Aside from the force necessary for the individual to maintain his equilibrium with his environments, he has a certain reserve force whereby he can rid himself of forengn substances to a certain extent. This is known as the internal body resistance. The second force acting is from without, and constitutes all bodies of whatever origin which the individual is capable of absorbing and which cannot be used to maintain the normal life phenomena. When the second bodies accumulate to such an extent as to preclude the normal amount of the former we have disease, just as if CO_2 would accumulate in the atmosphere to such an extent as to preclude the normal amount of oxygen we would have disease. This second force necessarily changes the tissues of the body so they cannot resist local bacterial action, hence bacteria under normal body conditions may become harmful under the second conditions—first, because of the lowered cell resistance, and, second, the cells under abnormal environments form a more favorable media in which to grow. For example, in diabetes we often find a local condition resulting in boils. If it were not for the first condition the second infection could not take place. So in intestinal putrefaction where bacterial products are absorbed we have a foul breath and often local lesions in the mouth, and when the intestinal putrefaction is removed the local affection gets well.

This holds true for all slow local inflammatory processes of specific origin, as ulcerative stomatitis, pyorrhea alveolaris, etc. In these cases render the intestinal tract sterile and you have gone far toward

curing the local disease. For instance, inoculate an individual with a virulent culture of diphtheria germs and diphtheria develops; but reduce the virulence of the bacteria, say 20 per cent, and no disease results. Why? In the former case the toxic power of the bacteria was 20 per cent greater than the internal resistance of the individual. Now reduce the individual resistance 20 per cent and diphtheria may again develop. It is well known that body fatigue is conducive to infectious diseases. Here the infection remains constant, but the fatigue reduces the internal resistance.

The animal body is in itself sterile, that is, it is normally free from all living organisms. In fact, the secretions of the body are more or less germicidal and antiseptic. We know that the blood serum is quite germicidal and also some of the digestive secretions. The gastric juice possesses marked germicidal properties. But notwithstanding these facts, the alimentary canal, especially the part below the stomach, and more especially the large intestines, are in many respects a favorable habitat for the development of bacteria.

We have seen that the body secretes certain enzymes which disassociate the foodstuffs, viz., carbohydrates, proteids and fats, rendering them capable of absorption and utilization by the tissues. In like manner nearly all forms of microorganic life (bacteria) have an enzymotic action, that is, they also have the properties—either by a secreted enzyme or by cellular contact—of disassociating the foodstuffs, and, in fact, acting further upon the end products of intestinal digestion, forming chemical compounds which, though absorbable, cannot be appropriated by the body cell for purposes of nutrition While the action of bacteria in the foodstuff is in many respects analogous to that of the digestive ferments, bacterial action does not stop with the production of substance which the animal can subsequently utilize. Thus the starches and sugars are not only changed to maltose and dextrose, but are further changed into material in which very little energy remains. Thus glucose $C_6H_{12}O_6$ in contact with bacteria is changed not to maltose ($C_{12}H_{22}O_{11}$), but to alcohol C_2H_5OH and carbonic acid CO_2, and further the alcohol C_2H_5OH in contact with bacteria is changed to acetic acid (CH_3COOH). Also glucose $C_6H_{12}O_6$+bacteria may be changed to CH_3 CH (OH) COOH lactic acid. Further, lactic acid may be further changed to butyric acid.

$$2\ CH_3\ CH\ (OH)\ COOH = C_3H_7COOH + 2CO + 4H$$

lactic acid — butyric acid.

Thus we find that the end products of intestinal carbohydrate digestion are maltose and dextrose; the end products of bacterial action are certain fatty acids, viz., acetic, lactic and butyric, none of which can be used by the tissues of the body, either to restore waste tissue or to form energy. They are not only useless but in a way harmful, in that they deprive the body of one of its food principles, just as in the case of replacing the oxygen of the air by CO_2. It deprives the body of oxygen, but some of these acids are poisonous, as for instance, various volatile fatty acids, succinic and the bile acids.

Also as regards albumens. The end product of intestinal digestion is a non-coagulatable albumen—peptone. But as a result of bacterial activity other substances are formed, such as amido acids, indol, skatol, phenol, etc., none of which can be used by the body. Thus bacterial action can deprive the body of the albumens so necessary for its nutrition. The fats likewise do not escape bacterial action. As in the case of the steapsin of the pancreatic juice, bacteria can disassociate the neutral fats into glycerin and the corresponding fatty acid, but the bacterial process extends still further and results in a gradual reduction of the higher fatty acids to the lowest forms. Thus we find as a result of bacterial action on palmitic, stasic and oleic acids, butyric and acetic acids formed, which are of no use in the animal economy. Thus we see how bacteria can deprive the body of its normal food principles by replacing the normal products of digestion by products which cannot be used for nutritional purposes.

But aside from these bacterial decomposition products certain specific poisons may be formed which give rise to pathological conditions. These are the products of specific microorganisms and are termed ptomains or cellular toxins. These bacteria are not the ordinary putrefactive bacteria which are everywhere present, but are the so-called pathogenic bacteria and seem to enter the body at special times and under special conditions. In Asiatic cholera and also in cases of cystinuria putrescin and cadaverin are found in the intestines, both well known bacterial poisons. Also the Eberth bacillus is a special germ which under certain conditions may enter the alimentary tract and find a favorable habitation for growth. Here it elaborates its special proteid toxin, probably from its own cell and not from the media upon which it lives. That is, it does

not act directly upon the contents of the intestines, changing albumoses into indol or skatol or other proteid decomposition products, but lives upon the tissues and draws its nourishment from its surrounding proteid media, and at the same time secretes its individual special cell toxin, just as a snake lives upon certain food, but does not directly decompose the food into snake venom by its simple contact; as the yeast fungi change grape sugar into alcohol and CO_2, but secrete a specific cellular toxin. Hence we no longer speak of ptomains, which term primarily was used to designate all poisonous substance found in decomposing proteid matter, but we speak of cellular toxins, meaning a specific poison secreted by a specific bacterium. In this sense the Eberth bacillus, after having gained an entrance into the intestinal canal, secretes its specific cellular toxin which when absorbed into the body gives rise to the pathological conditions and symptoms characteristic of typhoid fever. The same is true of diphtheria. The germs do not change the proteid substance of the lymphoid glands in the throat into poisonous substances, but simply live upon these glands and secrete a cellular toxin which produces the local cell coagulation, and, when absorbed, the specific general symptoms characteristic of diphtheria. The same is true of tetanus, anthrax, cholera, yellow fever, malaria, and is probably true of the specific cause of all diseases. These facts constitute the specific nature of disease. Another biological factor is: Specific cell toxins, when taken into the body in small quantities, gradually render the body immune so that even large quantities of the toxin have no further toxic effect. This is true of snake venom, the poisonous secretion of insects, and in fact, so far as we know, is true of all cell-secreted diseases. Herein lies the so-called self-limitation of infectious diseases. The bacteria secrete their cell toxin, which in turn is absorbed into the system and produces its characteristic symptoms. But if the affected individual possesses sufficient vitality to withstand the poison for some time, an immunity begins to develop, and in consequence the poisonous symptoms cease—the disease is self-limited—although the specific bacteria may still remain in the body in the form of non-virulent bacteria.

The first observations made in this direction were that certain albuminous substances found in vegetables were exceedingly poisonous, and also that animals could be rendered immune to these

poisons by administering in small but gradually increasing doses. These substances were termed tox-albumens. Two notable examples of the substance are ricin, an intensely poisonous globulin found in the castor bean, and abrin, found in the jequirity bean.

We do not know the chemical nature of this immunity. We simply know the fact that cellular toxins do confer an immunity against themselves, each specific toxin conferring an immunity against itself, but not against other toxins of different specific origin. Thus diphtheria toxin will not confer an immunity against typhoid toxin, any more than cobra venom will confer immunity against ricin toxin.

Aside from these acute affections we have a great variety of local pathological conditions due to microorganisms, such as local abscesses, boils, abscesses in the mouth, especially about the teeth (pyorrhea alveolaris), local inflammatory conditions around the nails, etc., which are slow in their development, and are always accompanied by certain forms of bacteria. A few notable examples of these are as follows: Actinomycosis, or the ordinary ray-fungi common among cattle. Here we have primarily a local condition due to the development of the ray-fungi in the tissues. Again we have local tubercular abscesses about the joints due to the entrance of the tubercle bacillus, or we may have local abscesses about the roots of the teeth (pyorrhea alveolaris) seemingly due to the invasion of the tissues by a certain specific bacterium. We could enumerate like cases *ad infinitum*. These latter, primarily local conditions, do not seem to be self-limiting, and seem to make their appearance only under certain conditions.

There is a marked difference between the bacteria in the intestines, which have only the power to act chemically on the foodstuffs, as the lactic, acetic or butyric acid bacilli do, and the bacteria that secrete specific cellular toxins. The former cause the so-called intestinal fermentations, which give rise to the so-called auto-intoxication, which simply means that the intestinal canal has become infested with a great number of fermentative bacteria, and their products being absorbed produce a set of indefinite symptoms, but do not possess any specific characteristics. Auto-intoxication, according to our present biology of disease, is a misnomer. Poisonous substances formed in the intestines during external digestion are outside of the body, and exert their influence only after absorp-

tion into the body, where they hinder the nutritional or metabolic processes of the cell. There can be no such process as cellular intoxication or disease arising from within the cell. Therefore, we shall discard the term auto-intoxication and maintain that all disturbances of cell metabolism originate from without. The derangement of cell activity is only the result of these foreign substances after absorption.

But what effect have these non-specific bacteria, which are so prevalent in the intestinal canal, on the general health of the individual? Neither they nor their products have any power to set up any specific pathological condition. In the first place, they simply act as food destroyers, and in the second place, their products are in many cases poisonous to the cell. Thus the vitality of the individual is lowered and the cell metabolism is generally depressed so that its chemical changes are not complete.

What effect have these conditions on specific disease-producing bacteria? To say nothing about the very acute infectious diseases, as diphtheria, scarlet fever, typhoid fever, smallpox, etc., all of which are combated by a biological antitoxin, we have numerous local processes of slower development due to special bacteria which, if confronted by an antitoxin at all, it has little power to self-limit the process. These primarily local processes do not tend to heal spontaneously. We might mention among these the various stoatites, local ulcerations around the roots of the teeth, local skin diseases due to the various blastomycetes, acne, psoriasis, eczema, etc., all of which we have very good reason to believe are due to specific microorganisms. While we cannot say that all diseases are due to bacteria as a primary cause, we can say that all diseases of which we have any definite knowledge of their primary cause are due to bacteria or parasites, and we are justified in assuming that all diseases are primarily of life origin. The reason we have not demonstrated this to be true in all cases is not the fault of the bacteria or parasites, but to our lack of methods for finding them.

In this respect we can only note certain facts. We know when intestinal digestion is interfered with by bacteria local diseases of specific origin are much more prevalent. No dermatologist would think of treating eczema without first putting the intestinal tract in as sterile a condition as possible. No physician of intelligence would attempt to treat a case of anemia, pernicious or secondary,

without first looking carefully to the cleansing of the alimentary tract. No dentist would attempt to cure a case of pyorrhea alveolaris without first seeing that alimentary digestion is interfered with as little as possible.

Facts almost drive us to the conclusion that the greater part of local subacute inflammatory conditions is due to two factors: First—Interference with external digestion as a predisposing cause. Here the tissues become starved and at times poisoned. Second—The entrance of specific microorganisms capable of setting up a specific pathological process. The first simply prepares the way for the second, and when the first is removed the second more readily succumbs to local antiseptic treatment.

It is often observed that stomatitis develops when the bowels are poor or the patient is suffering from constipation. Also that the stomatitis will persist in spite of all local treatment until the alimentary tract is cleared out, when it readily heals. The same is true of all non-malignant local ulcers, as boils, rectal abscesses, etc., and of almost all of the specific skin diseases. A notable disease might be mentioned in this connection, viz., pernicious anemia. This is at present of unknown origin, but is in most cases accompanied by intestinal trouble—a marked increase in the number of bacteria in the bowels, and an accumulation of these products, amido acids, sulphur compounds, etc. Very often as soon as the bowels are rendered practically aseptic the blood changes characteristic of the disease disappear.—*Review.*

PRESCRIPTION WRITING IN DENTISTRY. By W. F. Harrar, D.D.S. Read before the Susquehanna Dental Association, May 15, 1903. A correctly written prescription presupposes at least a fairly accurate knowledge of those medicinal agents employed for therapeutic purposes in the practice of medicine and dentistry. An incorrectly or carelessly written prescription frequently may be prejudicial to the reputation of the prescriber quite regardless of his actual qualifications. The persistent exercise of care in writing for drugs will result in a habit of accuracy and discrimination that eventually gives the prescriber an invaluable knowledge of the agent which he employs. It should not be inferred that the position is taken that any one thing will constitute a standard for determining professional ability, but a series of

errors or mistakes will nevertheless detract from the standard of general attainment.

Dentists, it must be admitted, in many instances are prone to carelessness in prescribing or else entirely overlook the benefits to be derived from an intelligent application of drugs in treating various dental disorders amenable to medication. As a profession we assert our right to prescribe whenever conditions associated with oral disease make such treatment desirable. Whether this is always wisely done is open to question. A large number of dentists no doubt prudently refer their patients to the medical practitioner. Of these some, conscious of an imperfect knowledge of remedial agents and measures, naturally would hesitate to prescribe; others, while possessing this knowledge, prefer to eliminate any possibility of mistake and therefore do not undertake it. The second class—those who do prescribe—while cautious and fully aware of their responsibility, believe that in the advanced position of our profession the members thereof should avail themselves of the curative forces at their command. With these it becomes a matter of concern to adopt and systematically pursue a course of treatment calculated to attain the desired result. Cognizance is taken of the basal conditions, the state of nutrition, the perverted action of any organ—exhaustion, depression, or excitation, or any of the indications of nature for relief in disease. This does not mean that the dentist should undertake the treatment of complicated oral cases or such as are not associated with oral disease. Far from it, and in grave cases of the former it should not be attempted, but in the study of conditions of health or disease the dentist enjoys advantages that will materially broaden his professional capacity if improved.

Every dentist, at some time or other, will be confronted with the necessity of writing a prescription—whether for a stimulating or astringent mouth wash, or for conditions involving a wider application of drugs. In so doing there arises at times no little perplexity as to the nomenclature, terminology, and proper use of abbreviations. A little attention given to the spelling of pharmacopeial names, together with a very elementary knowledge of Latin, will suffice. Mistakes in terminology frequently are due to an imperfect knowledge of the Latin case terminations, or to a confusion of the declension to which the noun in question may belong. By

bearing in mind a few simple rules, as far as they may be applicable, the Latinizing of a prescription will be simplified. First, it should be remembered that, with a few exceptions presently to be mentioned, all pharmacopeial nouns and adjectives are changed from the nominative to the genitive case, singular number. The nominative is the case in which they are given in the pharmacopeia, except in compound terms, where one noun in the genitive case modifies another in the nominative—for example, Sodii boras—a borate of sodium or borax—sodii here shows the kind of borate. In a prescription the nominative only would be changed, so that this article would read Sodii boratis. Second, nearly all pharmacopeial preparations are in the first three declensions; only three—fructus, spiritus, and quercus—are in the fourth, and these have the same genitive ending, *us*. Third, all pharmacopeial names ending in *a* are of the first declension. The genitive is formed by changing the termination *a* to *æ*. Physostigma and aspidosperma are exceptions, taking the ending *atis*. Fourth, all pharmacopeial nouns ending in *us* and *um* are of the second declension, and take the genitive form by changing the *us* or *um* to *i*. The exceptions are rhus, which changes to rhois, and the nouns of the fourth declension previously mentioned. Hematoxylon, an astringent coloring matter occasionally employed by dentists, also takes the ending *i*. A large list of drugs of interest to us come under this declension. Acidum, vinum, extractum, and syrupus are examples of classes of preparations. Arsenosum, iodum, aconitum, opium, gelsemium, pilocarpus, acetanilidum—in all about three hundred—take the ending *i*. So, bearing this in mind, no perplexity should be experienced as to their terminations.

For the third declension no rule applying to all the names can be given. A number of exceptions exist which must be memorized. The number, however, is not large. Others, again, are indeclinable. There are, however, a number of preparations which can be grouped and have endings according to their root stem in the Latin. All nouns ending in *as* (except asclepias, -adis, and mas, -aris) take the ending *atis* in the genitive. About one-fourth of the titles of the third declension belong to this group. Example, ammonii nitras would be written ammonii nitratis. Words ending in *is* are placed in the genitive by changing the *is* to *idis*. Example, cantharis, cantharidis. The exceptions are pulvis, sulphis, phosphis,

arsenis, and all salts ending in *is* which have for the genitive *itis*. Sinapis, digitalis, hydrastis, and cannabis do not change. Of the remaining official preparations of this declension such a diversity of genitive endings exists that a classification can hardly be attempted. Still, however, it may be helpful to remember that *o* is changed to *onis; l* to *lis; en* to *inis; ps* to *pis; rs* to *rtis; r* to *ris;* and *x* to *cis*. The exceptions are but few—mucilago, mucilaginis; fel, fellis; mel, mellis.

There are a few pharmacopeial nouns which, so far as relates to the genitive, are indeclinable. Among those of interest to us are amyl, catechu, elixir, eucalyptol, kino, menthol, naphthol, salol, sassafras, and thymol. To these may be added the three nouns of the fourth declension—fructus, spiritus, and quercus. A few preparations have the ablative case after *cum*, which remains unchanged in writing for them. To illustrate, Syrupus hypophosphitum cum ferro would be written for as Syrupi hypophosphiti cum ferro. Tinctura is a noun, and is given in the nominative case. The word naming the kind of tincture is a noun in the genitive, for example, Tinctura iodi comes under the first and second declensions. Iodi, from Iodum, however, is already in the genitive, so the noun tinctura alone is changed to Tincturæ. This may seem very elementary and possibly unnecessary to many, particularly to those versed in prescription writing.

Adjectives are placed in the same case as the noun they modify, but do not necessarily have the same case ending, as there are no adjectives of the fourth or fifth declensions in Latin. For example, Spiritus ammoniæ aromaticus would be written Spiritus ammoniæ aromatici. Attention may be directed to the termination *æ* in ammoniæ in contradistinction to the *ii* as in Liquor ammonii acetatis; the difference being due to the fact that the first is a hydro-alcoholic solution of ammonia with aromatic oils, and the second an aqueous solution of a salt formed from the base ammonium and acetic acid. The agreement in case of adjectives will be well illustrated by using a noun of each of the different declensions and noting the terminations of the adjectives and nouns. Tinctura cinchonæ compositus would be Tincturæ cinchonæ compositæ; Syrupus sarsaparillæ compositus would be Syrupi sarsaparillæ compositi; Liquor calcis chlorinatæ would be Liquoris calcis chlorinatæ, the adjective here being of the second declension, the nouns

of the third; Spiritus juniperi compositus would be Spiritus juniperi compositi.

In this particular phase of prescription writing considerable difficulty is experienced so far as the terminations are concerned. As a matter of fact abbreviations, while allowable if properly used, are frequently employed to avoid the perplexities of case endings. The practice is common, though in a number of instances it is either positively dangerous or quite misleading. To illustrate, Acid. hydroc. dil. may be taken for Acidum hydrochloricum dilutum or Acidum hydrocyanicum dilutum; Hyd. chlor. may mean calomel corrosive sublimate, or chloral hydrate; Potass. sulph. may mean potassii sulphas, potassii sulphis, or potassa sulphurata. Loss of life has resulted more than once from improper abbreviations. For this reason the cautious prescriber will be careful to safeguard his patient against any such possible mistake as might easily occur here.

In certain parts of a prescription abbreviations are recognized as legitimate. Usually no harm or perplexity ensues from their improper use. The mistakes likely to occur with them are in the use of grs. for gr. to denote granum or grana, grain or grains; gtts. for gtt. gutta, guttæ, drops; the use of Roman instead of Arabic numerals. These are minor matters and perhaps may appear trivial, but it is just as easy to be correct and so convey a favorable impression. In the hands of a skilful and intelligent pharmacist these details will be noted and comment made accordingly. The writer has had prescriptions, some written by dentists, shown to him that were a study in the misuse of terms, English, Latin, and abbreviations. In one apparently all the sins on the calendar were committed. The remarks they evoked from the several pharmacists were far from flattering.

A common error in the directions to the pharmacist is illustrated in the following formula:

℞ Acetanilidi, gr. xx;
Caffeinæ citratis, gr. v. M.
Ft. in chart. No. ii.

Sig.—Take second powder one hour after first.

In this prescription the question arises whether the prescriber intended the above to be divided into two powders or whether two powders each containing the quantities indicated should be made. While the pharmacist, considering the dose of acetanilid, undoubtedly

would divide the quantity, unless underscored, into two powders, this ambiguity would be avoided were the directions to read, Misce et in chart. No. ii div.—Mix and divide into two little papers; or, Ft. pulv. in chart. No. ii div.—Fiat pulvis in chartulas ii dividenda—that is, Let a powder be made to be divided into two little papers.

A few other faults in prescription writing will be mentioned. One of these is transposition. Some physicians and dentists are in the habit of first writing down the ingredients, after which the quantity of each is indicated. Errors are easily made by transposing the quantity of one for another. Some glaring mistakes have been made in this manner. The use of antiquated terms (Tinct. thebaici for Tinct. opii), indistinctness, illegibility, misspelled words, imperfect terminology, improper abbreviations, and the confusion of Latin and English synonyms constitute some of the more important and common faults.

In the selection of drugs the prescriber is guided by the therapeutic action desired. This comes under the scope of general therapeutics, and is as extensive as the treatment of disease. In the combination of drugs good, indifferent, and bad prescriptions are written. Incompatibilities occur, poor vehicles or excipients are selected, improper solvents chosen, or ingredients multiplied until their therapeutic action is entirely conjectural. The matter of compatibility is one of the perplexities that constantly besets the prescriber. Injudicious combinations of medicinal substances arise from so great a variety of causes that their enumeration is impossible. Nothing less than a thorough knowledge of the physical and chemical properties of all the substances in materia medica would prevent incompatibility. So with our human limitations, the majority of us will continue to make mistakes, but the number should be gradually lessened.

Of combinations wherein the dentist most likely will err a few will be enumerated. 1. "The precipitation of an insoluble salt by the addition of one solution or salt to another;" for example, the soluble salicylates are decomposed by acids and the nearly insoluble salicylic acid formed. 2. The addition of alkalies, alkaline salts, or salts to alkaloidal salts will produce insoluble compounds. In order to make alkaloids soluble in water they are converted into a salt by the action of an acid. Now, the addition of an alkali will

displace the alkaloid which will be precipitated. Alkaloidal salts should be prescribed alone. 3. Acids are incompatible with alkalies, acetates and metallic oxids. 4. Alum with alkalies and alkaline carbonates. 5. Chlorate of potassium with mineral acids, organic substances, sulphur, carbon, calomel. 6. An acid should not be added to a tincture. 7. Tannic acid should never be added to solutions of alkaloids. 8. Fluid extracts are incompatible with water. 9. Alcoholic solutions of camphor and resinous substances cannot be mixed with water. 10. Vegetable acid salts are changed by mineral acids, and decomposed by alkalies. 11. Calomel and antipyrin are incompatible. 12. Aconite should be ordered in water alone. 13. Pepsin cannot be given with alcohol or tinctures. 14. Medicated waters with salts will cause precipitation, a frequent experience with dentists. 15. Oxidizing agents must never be added to organic and readily oxidizable substances.

Finally, in writing a prescription care should be taken to adapt the number of doses to the probable length of time it shall be used. To write for three times as much as may be necessary is not always appreciated.—*Brief.*

PROPHYLAXIS OF BALDNESS. (*Jour. Am. Med. Assn.*) If anyone had insisted twenty-five years ago that tuberculosis was only slightly hereditary but distinctly communicable he would have been laughed at. The germ theory has now become a doctrine of ever-widening scope, and we realize that many affections are directly communicable and only a few hereditary. At the present moment it seems that even for so old-fashioned an affection as baldness a complete change of opinion as regards etiology is taking place. As with tuberculosis, so it has long been noted that baldness is likely to run in families. The sons of bald fathers are all the more likely to become bald young, and it is not the rule to find a single bald brother where there are a number in a family. On the other hand, daughters seldom become bald, but then the women folk rarely use the combs and brushes of the male members of the family, while boys not only use such articles in common, but often exchange hats, have their hair cut frequently at barbers, and in general are not rarely in circumstances in which they are likely to contract the disease, if it is communicable.

It is nearly ten years now since Sabouraud at the Pasteur Insti-

tute pointed out that premature baldness is practically always associated with the presence of certain bacteria. The seborrheic condition causing what is known as dandruff, on which early baldness probably often depends, he demonstrated to be a very probable result of the presence of these microorganisms. Bacteriologic investigations made since have tended to confirm this opinion, and while they have failed to show the existence of any specific germs, they have made it appear probable that microbes play an important rôle in causing the increased desquamation of the epithelium which chokes up hair bulbs and finally leads to their obliteration. Undoubtedly the ordinary conditions of scalp hygiene among men are favorable to the development of these germs. The circulation to the scalp all comes from the vessels of the neck and finds its way over the bony skull to be distributed to the hair bulbs. It is especially likely to be interfered with by the pressure of the hat band, and that this is an important factor in the etiology of alopecia can be seen from the fact that baldness always begins just above the occipital prominence at the back or above the frontal bosses anteriorly, that is, just where the pressure of the hat band on blood vessels is most likely to be occlusive. This interference with the circulation lowers the resistive vitality of these parts of the scalp and consequently provides opportunities for the growth of microorganisms. It must not be forgotten, moreover, that these three points mentioned are especially liable to infection. The comb and brush are used particularly in arranging the whorl of hair in the occipital region and in parting the hair and brushing it back over the frontal bosses anteriorly. If infection plays an important role, then, in the production of baldness, these are just the parts that theoretically should be first affected, and from which infection should spread to the other parts of the head. As a matter of fact this is what occurs in practice.

Greater care should be taken with regard to brushes and combs, especially in families in which early baldness is the rule. The hair brush should be dipped in an antiseptic solution several times a week. Combs should be boiled regularly and frequently, and under no circumstances should members of precociously bald families use other combs or brushes than their own, or allow them to be used on them in barber shops, unless they are assured of their sterilization beforehand. These precautions may seem a high price to pay for

the prophylaxis of premature baldness, and many will prefer to take the chance of becoming bald, but some have such a horror of the affliction that they will willingly put themselves to much trouble to prevent it.

ESTHETIC FAILURES IN DENTAL PROSTHESIS, WITH SUGGESTIONS FOR THEIR AVOIDANCE. By J. B. Willmott, D.D.S., Toronto. Read before the Missouri State Dental Association, May, 1903. While great advance has been made in the treatment of pathological conditions of the teeth and associate parts, and in the materials and manipulations for preserving the natural teeth, but little advance has been made in the art of replacing lost teeth by artificial dentures. Since the introduction of hard vulcanite as a base more than forty years ago, and celluloid a few years later, practically nothing has been added to our equipment for aiding those who have been so unfortunate as to lose their natural dentures, nor with the materials in use have we improved to any appreciable extent the artistic results of our work in dental prosthesis. Many causes have probably combined to hinder progress in this direction, and not the least has been the tendency in many quarters to belittle what is somewhat contemptuously styled "mechanical" dentistry. Everyone who has had any experience in connection with dental college work has observed that with very rare exceptions students are far more anxious to become expert operators than skillful and proficient in the line of prosthetics. I presume it is a common experience with the heads of the prosthetic departments in our schools that it is exceedingly difficult to induce students to properly appreciate the importance of this branch of dentistry, and to give the time and attention necessary to acquire more than a mere perfunctory acquaintance with it. To "pass" largely marks the limit of their ambition in this direction. One of the problems before the profession to-day is, How may we excite greater interest and enthusiasm in this subject, not only in the student but also the practitioner? But this is only distantly germane to the subject I have attempted to discuss.

In undertaking the insertion of an artificial denture the operator has or should have in view at least three distinct and important considerations: (1) The restoration of the lost function of mastication; (2) The restoration of the partially lost power of distinct

articulation; (3) The restoration or preservation, as the case may be, of the profile and expression of the patient. The first two are what may be called the practical aspects of the operation, and so far as health and comfort are concerned may be considered as the most important. In the hands of competent practitioners these are in a great majority of cases fairly well accomplished. Unfortunately as much cannot be said for the artistic result. When all the teeth are removed from both or either maxilla absorption of the alveolar process takes place, the bone being followed by the soft tissues immediately attached to it. The change in size and outline of the base upon which rest the muscles of expression must of necessity change the form and expression of the face. To prevent this change, or to restore the original form if already lost, and so conserve or restore the natural expression, is the artistic duty devolving upon the worker in dental prosthesis. In the change of expression two main factors have been concerned, the loss of the teeth and the loss of the alveolar process. If the expression is to be restored both of these must be replaced to secure artistic or esthetic results.

In consequence of the changes in anatomical form which take place under the conditions named, and especially in connection with the cuspid eminence, it may be frankly admitted that perfect restoration of the form of the base on which the muscles of expression rest cannot be accomplished, and consequently where all the teeth are lost the expression must to some extent be permanently altered. Speaking generally of the great mass of people who wear artificial dentures, to assert that this change in expression is much greater and is everywhere much more manifest than it need be, is a statement that will scarcely be questioned by a professional audience.

This, however, is not the only source of esthetic failure in dental prosthesis. Some time ago I asked an intelligent lady, who is not a dentist, and is not specially endowed with the artistic taste, but who has at least an average appreciation of the harmonies in color, form and size, how she most readily detected artificial dentures as she was brought in contact with people. The reply was prompt, "Teeth are too small, too white, and too even, especially on the incisal edge."

Surely the fact that artificial dentures are so generally capable of easy detection by persons not in any way instructed in the art of

dentistry indicates an artistic failure so widespread as to suggest that it cannot all be inevitable, and that it might be and should be very greatly lessened. To assist in giving point and definiteness to this discussion, permit me to tabulate six of the more common esthetic failures, and then to consider them in order: (1) Teeth are too small; (2) teeth are too light in color; (3) teeth are too perfect in alignment; (4) teeth are not adapted to age; (5) muscles of expression are not sufficiently supported; (6) profile is injured by too close an occlusion. These defects may be divided into two classes: Those which are apparent only in conversation or in laughing, and those which are apparent when the features are in repose. The first four will fall into the first class, the other two into the second class.

1. What is the effect of choosing "teeth that are too small?" *They are out of harmony with their environment.* Nature permits a considerable latitude in this respect before the lack of harmony becomes marked. This limit is, however, so often and so greatly exceeded that the defect has become sufficiently common to be noticed by patients themselves. The worst result, however, is not want of harmony. Where teeth which are too small are used the cuspid comes forward so that it cannot perform its function of giving character to the features, and the expression becomes weak and insipid. Then the first bicuspid comes forward into sight, so that eight instead of six teeth are clearly in view when looked at from directly in front, giving the impression of "too much teeth," and, especially when light in color, presenting the appearance of a white band stretched under the lip. A good rule is to fix the position of the cuspids and then select laterals and centrals to fill the space. It is objected, and with a great deal of truth, that patients will not accept teeth which are sufficiently large. Last year at the Maritime Provinces Association this matter was under discussion, when a gentleman stated that he never made a denture which did not entirely conform to his best judgment of what the case required. Observing a look of incredulity spread over the faces of his audience, he hastened to add, "I don't have to." In these days of increasing competition I fear his experience is unique. Most of us, I imagine, feel it necessary to pander more or less to the whims, fancies, and prejudices of our patients. We ought, nevertheless, to educate them. How? A very good plan for young practitioners, and not bad for older ones, is to make a collection, as opportunity presents, of models

of good natural dentures. These will illustrate the relation between size of tooth and size of maxilla, and will assist in securing the acquiescence of the patient.

2. *Teeth are too light in color.* It is amazing what a large percentage of those who apply for artificial dentures had originally "beautiful, small, white teeth," and of course this is the class of tooth now desired. The basis of the difficulty in making a proper selection is the absence of the sense of harmony in the assembling of colors. The patient who wears yellow, blue, green and orange trimming on the same hat without any consciousness of the incongruity will hardly discriminate intelligently in the color of teeth. Whatever of failure is manifested in this direction is, however, largely the fault of the operator. Patients are more amenable to teaching here than in the matter of size. There is but one way in determining a suitable color of teeth for any given patient, and that is, trying it in the mouth—not a single tooth, but at least the anterior six—and judge them in the environment in which they are to be placed. No amount of theoretical teaching about temperament in relation to tooth color will ever enable a practitioner to certainly select a suitable color without testing in the mouth.

3. *Too even in alignment.* I have recently had the opportunity of comparing the articulated plaster casts of the impressions from eighty young people from eighteen to twenty-five years of age. After forty years' experience the casts have been a revelation to me as illustrating the variations from perfect evenness in natural dentures. The fact that an unusually perfect set of natural teeth is commonly suspected of being artificial is sufficient evidence that we follow too rigidly the "perfect ideal" in the arrangement of the teeth on our dentures. Nature rarely gives us this ideal. Probably the best method of getting so familiar with natural alignments that we can closely imitate them in artificial dentures is to be found in the careful study of considerable numbers of articulated casts of natural teeth.

4. *Teeth are not adapted to age.* An artificial denture which in general form and appearance of the teeth is quite suitable in a girl of twenty, would if worn by the same patient at seventy be as much out of place, quite as absurd, and as clearly artificial, as golden hair and a pink-and-white complexion would be at that age. It is objected that if the lady had retained her own teeth they would be

the same ones she had at twenty. Very true, the same teeth, but showing as clearly the result of advancing years as the hair or complexion. In early life the incisal edge of the incisors is convex; the mesial, distal, and labio-incisal angles are beautifully rounded; the point of the cuspid is sharp. In middle to old age, as the result of wear, the incisal edge becomes straight or concave, the mesial and distal angles sharp, the labio-incisal angles sharp and nicked, the cuspid is blunt, and the alignment usually becomes somewhat more irregular. How often do we attempt to imitate these changes? A set of teeth made from the same mould as would suit our young patient, but chosen several shades darker, can by the skillful and not very extensive use of the carborundum wheel be made to closely resemble what thirty or forty years of wear would have done for the natural teeth. If single teeth are used a little irregularity of alignment and possibly a little recession of the gum will complete the natural change, and constitute an artificial denture wholly in harmony with advanced years.

The esthetic failures we have thus far considered are revealed only when the movement of the lips in speaking or laughing exposes the teeth. Other serious failures are manifested when the features are in repose. These are of two classes: One characterized by a thinness of feature and a sinking of the lips and cheeks quite out of keeping with an otherwise full and well-rounded physique. The primary cause of this condition is either the prolonged absence of any teeth, natural or artificial, or the wearing of a provisional denture, generally though quite incorrectly called a temporary denture, long beyond the time when it should have been replaced, in many cases for several years. In either instance the muscles of expression which should have been supported have dropped to make contact with the shrunken maxilla, have themselves shrunken, and have become somewhat permanently adapted to their changed and contracted support. When these cases are extreme and of long standing restoration of expression is hardly possible. If in such a case the dentist were to insert a denture that would raise the lips and cheeks to their original position, the effect on the expression would be such that neither the patient nor his friends would tolerate it. If patients could be made to understand that in process of weeks, perhaps months, these muscles would adapt themselves to the improved support, their normal function be recovered, and the original

expression gradually restored, they might put up with the present unsightliness and wait patiently for finally satisfactory results. An alternate remedy would be to make a series of dentures at intervals of six months, each filling out slightly the sunken tissues, until restoration was completed. In a large proportion of cases neither of these propositions is practicable. The only remedy is prevention. If a dentist desires to permanently maintain a normal expression no falling of the mobile tissues of the face should be permitted. The mouth should not be for more than a few days without a denture. The provisional denture should support in their normal position the lips and cheeks, even if to secure this the fullness at first should be excessive. Satisfactory final results will far more than compensate for present inconvenience, extra attention, and (of necessity) extra expense.

The last of the esthetic failures to which I shall refer is due to too close a bite. The result is a shortening of the face, the projection of the chin, the protrusion of the lips, a falling in and puckering of the cheeks, the whole producing the expression characteristic of old age. Recent observation proves that this defect is very common. An examination of a considerable number of articulated casts shows the average distance from the festoon of the gum of the upper incisor to the festoon of the gum of the lower incisor to be fully half an inch; add three-sixteenths of an inch for the shrinkage from the full absorbance of the alveolar border in either maxilla, and we have a medium normal separation of edentulous jaws at the median line of proximately seven-eighths of an inch. Articulated artificial dentures measured with calipers show separation of from one-half to five-eighths of an inch, an unnatural closing of the bite of from three-eighths to one-quarter of an inch. Apart from the expression of premature age another difficulty occurs where the shortening is mainly in the upper teeth. The lip falls below the incisal edge and interferes with distinct articulation, to remedy which the patient in speaking makes very awkward efforts to raise the lip out of the way. When in closing the jaws the mandible is raised appreciably beyond the point where normal occlusion of the teeth would occur, the peculiar mechanism of the temporo-maxillary articulation throws the symphysis of the chin forward, a projection which increases as the mandible is raised. The result is to entirely change

the profile, and of course to materially and adversely affect the expression.

An individual who decides to exchange his natural teeth or what remains of them for artificial ones enters on an uncomfortable transitional period of approximately eight months before permanent dentures can be satisfactorily inserted. It is during this period that these changes take place which, if not properly counteracted, permanently affect the form of the features. As a means to a desirable end it is a good practice, when it is decided to remove all the teeth from either jaw, to first take an impression, make a model, and on it fit a trial plate, filling spaces left by missing teeth with sufficient wax, so that when placed in the mouth the teeth of the opposite jaw will close into it, thus securing an accurate bite. When the teeth are removed, take impressions and make models of both jaws, place the trial plate on the edentulous model, fit the teeth of the other into the depressions made in getting the bite, and transfer the whole to an anatomical articulator. The result is a perfect articulation, showing exactly the normal bite. Open the bite to compensate for half the anticipated shrinkage, and construct a provisional denture. The other half of the shrinkage may be readily dealt with and the normal bite restored when the permanent denture is inserted. If the teeth of both jaws are to be replaced, by far the best results, from the esthetic standpoint, will be finally attained by dealing with them separately; completing the permanent replacement of one before extracting the teeth from the other. Before extracting these last teeth follow the procedure just outlined, using the artificial denture in one jaw to obtain the normal bite.

The subject is interesting and inviting, but the time limit is nearly reached. Leaving detail and reverting to the general in this discussion, it may be observed that visible improvement in the esthetics of dental prosthesis will take place when adequate attention is given to it in our dental societies; when prosthetic dentistry is taken out of the hands of men who have had no other than a technical training, who know nothing about the anatomy or the functions of the tissues concerned, and who have no artistic tastes or appreciation, and placed entirely in charge of men scientifically and artistically trained. Improvement will probably be more marked when the men high in the profession cease to do their prosthetic work by proxy, taking the impression and the bite, selecting the tooth color,

and then handing the whole thing over for completion to a workman who never saw the patient. If even partial esthetic success is ever obtained by this method it must be purely by accident, certainly not as the natural sequence of intelligent efforts to a desired end.—*Western.*

EPULIS. By Faneuil D. Weisse, M.D., New York. Read before the Connecticut State Dental Association, April 21, 1903. This name is given to the neoplasms of the gum areas—fibroma, sarcoma, and osteosarcoma. *Frequency.* McCurd in his "Oral Surgery" quotes from Dr. Larabrie that of 1,156 tumors examined by him in eleven years, from all parts of the body, 32 were epulis. This series would thereby establish epulis as occurring once in thirty-six tumors of all kinds. *Location.* The inferior and superior arches are relatively involved in the proportion of two-thirds to one-third of cases. *Sex.* Cases occur relatively in females and males in the proportion of five to three cases. *Age.* The range of cases is from childhood to old age, but one-half of all cases occur before thirty years, and two-thirds before forty years.

Symptoms. A single nodule of the gum area; varying in size from a bead to a hickory nut or larger; springing from an interproximal space between teeth or an alveolus containing a root of a tooth; covered by normal mucous membrane which may be somewhat purplish in color; pedunculated, involving one surface of the gum only, or non-pedunculated, involving one or both surfaces of the gum; of slow growth, if of any size having a history of several years' duration; may separate the teeth an eighth, a quarter, or even half an inch; at times may include a root and even a tooth, dislodging it; may be ulcerated if caught in the occlusion of the teeth; and may be recurrent, cases presenting that have been removed several times and have developed again.

Etiology. Devitalized teeth whose pulp-chambers and root-canals have not been emptied of their necrotic contents and the teeth treated and filled, and retained roots—such tooth-conditions producing irritation of the gum or alveolo-dental membrane, thereby initiating the neoplasm. It is also possible that in some cases an accidental and unnoticed injury of the gum or alveolo-dental membrane may initiate the neoplasm.

Pathology. The pedunculated forms that spring from an inter-

proximal space between teeth and involve one gum surface, or that spring from an alveolus containing a root, have proved in my experience to be fibroma. I am inclined to regard this variety as having its origin from the deep gum tissue in the former case and from the alveolo-dental membrane of the alveolus in the latter case. The non-pedunculated forms, involving one or both surfaces of the gum, springing from an interproximal space, and spreading the adjacent teeth apart, have in my experience proved to be sarcoma with giant-cell constituents, and sometimes they also contain some osseous tissue cells, constituting them osteosarcoma. I regard this variety as having its origin from the alveolo-dental membrane. It is sometimes stated that epulis—fibroma, sarcoma, and osteosarcoma—originates from the periosteum of the free surfaces of the alveolar process. I have always held that the free surfaces of an alveolar process are not covered by periosteum, the alveolar process being only a temporary osseous scaffolding for the support of the temporary and permanent teeth respectively, not present before the eruption of the temporary teeth, but developing only as the need of tooth-support is required, and disappearing by absorption when the permanent teeth are lost. This life-history of the process proves that the presence of the alveolo-dental membrane is essential to the presence and perpetuity of the process. If the free surfaces of the alveolar processes were covered by periosteum the structure would not be absorbed as rapidly as it is after the loss of the teeth and their alveolo-dental membranes.

Prognosis. I have yet to see an ultimately fatal issue of a case of epulis—fibroma, sarcoma, or osteosarcoma. This leads me, when a case presents, to dispel the anxiety of patients even where the structure of the neoplasm is determined to be that of sarcoma or osteosarcoma. It is to be remembered that the sarcoma containing giant cells is the least malignant variety of the sarcomas, and the presence in the neoplasm of osseous tissue formation is not at all serious. Again, that the situation of the neoplasm is in a temporary scaffolding structure—the alveolar process—and that the growth having perfect freedom to protrude into a cavity does not bed, so to speak, so as to involve the body of the inferior or superior maxillary bone.

Prophylaxis. Remove the conditions favorable to the development of epulis by impressing upon patients the necessity of extracting roots of teeth and of having devitalized teeth emptied, pulp-chambers

and root-canals freed of their necrotic contents, treated, and filled, in order to protect them from the development of these neoplasms.

Treatment. In view of the etiology of these neoplasms adjacent roots should be extracted and the vitality of adjacent teeth be determined. If one or both adjacent teeth contain fillings they should be removed, and if the teeth are found devitalized they should be emptied of pulp-chamber and root-canal contents, and treated, but not permanently filled until the neoplasm has ceased to recur. If the adjacent teeth do not contain fillings they should be tapped, by drilling through the enamel at a proper point, and the sensitiveness of the dentin tested; if found devitalized they should be dealt with as above stated, and if found to be normal the drill-holes should be filled with gold.

The local treatment of the non-pedunculated epulis—sarcoma or osteosarcoma—as a rule requires surgical operation, with the object of removing the involved portion of the alveolar process, encroaching as little as possible upon the subjacent body portion of the maxillary bone. This latter point applies especially to the inferior maxillary bone. The operation is performed as follows: Adjacent teeth, where present, are extracted, the involved alveolar process is included between two cuts of a suitable saw, and the processes are removed with a pair of gnawing forceps, or the alveolar process is included and removed with a chisel and hammer.

Value of Acetate of Zinc. My principal object in calling attention to the subject of epulis is to bring to your notice the value, as judged from my experience, of the local application of the crystals of acetate of zinc in causing arrest of the growth when it first appears, prevention of recurrence after excision of the pedunculated variety, and even arrest of the growth and prevention of its recurrence after superficial excision of the non-pedunculated variety.

Given a case where at an interproximal point a small bead-sized epulis presents, the daily application of the crystals will cause its disappearance; should it recur the daily application must be resumed as required until it ceases to recur. The application is made by taking up a small piece of cotton in a pair of small forceps, dipping the cotton into the crystals, and applying them directly to the growth for a few minutes. After the application all crystals should be wiped from the adjacent mucous membrane before the mouth is closed. The patient can be instructed how to make the application.

Given a case of the pedunculated variety, fully developed, cut it off deeply with a pair of suitable scissors and immediately apply the crystals, which will stanch the bleeding. Thereafter the crystals should be applied once a day to the stump. The patient will experience a pricking sensation at the stump surface as they are applied, and during the day there will be some irritation of the area; the surface is at first blanched by the application.

Treatment Applied to a Case of Sarcoma. I will here detail a case of special interest. In January, 1899, a woman presented with an epulis of a year's growth, about the size of a large pea, located at the interproximal space between the upper central incisors of a full denture of beautiful teeth. It was non-pedunculated, involving both surfaces of the gum, and had separated the incisors a quarter of an inch. It was evidently a case of the sarcoma variety of epulis, originating from the alveolo-dental membrane. The question at once arose: Could the incisor teeth be saved by averting the necessity of an operation? The patient was told of the possible necessity of an operation which would involve the loss of the teeth, but at the same time she was told that were she willing to have it undertaken an attempt might be made to save the teeth by arresting further progress of the growth, and possibly effecting its ultimate disappearance; this, however, would take time and patience, and of course might not succeed.

The patient agreed to having the attempt made. The incisors were not filled, and her dental surgeon was directed to tap them and test their vitality; the teeth were found normal, and the drill-holes were filled with gold. In January, 1899, the neoplasm was cut away as deeply as possible; acetate of zinc crystals were applied, and the patient was instructed how to apply them once daily. The growth persistently recurred, and for seven months it was excised once or twice each month. Then there was an interval for two months (July to September, 1899) when it was found to have recurred to some extent, and again for three months (September to December, 1899) it was again excised once a month. The patient next called May, 1900, when the growth was found to be about a quarter of its original size, and there was an appreciable diminution of the space between the incisors. It was again excised repeatedly for two or three months, when the patient passed from my notice with directions to continue the application as required.

I had not seen the case since September, 1900, but lately, desiring information for the purpose of this paper, I wrote asking as to the present condition of the case, and received the following answer, of date March 1, 1903: "In regard to my wife's case I would say, for about a year after her last call (this was September, 1900) she treated herself, and since that time it has given her no trouble, and has not appeared to grow at all." Considering the nature of the neoplasm and the original conditions this is certainly a remarkable result. I would here state that although there were persistent recurrences of the growth, they were notably and progressively less active during the progress of the treatment.—*Cosmos.*

ANODYNE REMEDIES. By N. S. Hoff, D.D.S., Ann Arbor, Mich. Read before the Central Michigan Dental Association, May 14, 1903. The meaning of the term Anodyne is "to be without pain." Therapeutically, it is that which assuages or relieves pain. To define the term for our purpose we must consider the therapeutic application of this class of remedies as used in dental practice. They are sometimes referred to as analgesic or antalgic remedies. Anodynes may properly embrace all agents which will relieve pain in any measure or by any method. Somnifacients, anesthetics, narcotics, obtundents, demulcents, emollients, sedatives, correctives of various kinds are examples, because they may be employed to overcome painful conditions. A narcotic may be used as an anodyne remedy, but it may also be used as an anesthetic. An anesthetic is, however, rarely used to overcome pain, but to prevent it. For convenience we may separate the anodyne remedies into two classes: Those having a local use only, and those having general or systemic application. We shall, however, find that some anodyne remedies have both a local and systemic action.

Local anodynes are those which act because of physical or mechanical properties—heat, cold, electricity. They may be remedies of the chemical form; used easily as local applications for local effects, or to produce local effects from central or systemic action. We also have operative procedures, including all surgical means used to stop pain.

Systemic anodynes are those which are used in the drug form having properties which overcome pain from a central action upon the nervous system through organic functions. The anesthetics

might form one class; the narcotics another class; the cardiants, or those remedies which affect the blood circulation, a third class; and a fourth class the organic stimulants which are used to produce revulsive effects by depleting tissues which are locally congested, through some other organ or tissue which the drug stimulates inordinately or at least to the extent that it eliminates plethoric conditions which cause pressure and pain.

It is only when some extraordinary impression is made on the nervous system or the organs influenced by it that it becomes irritable or painful. The nerves of sensation of the mouth and face largely pass directly into the skull to the brain without passing through the spinal cord—as do the nerves of the trunk—and dental pains are generally severe and without systemic complications. Curing toothache by stopping the cavity or treating the tooth only is but one method. Pain may be felt in exposed dentin and not be due to it, but to an impediment on the nerve trunk at some point in its course. Intense toothache is not always due to exposure of the dentin, but possibly to an internal nervous disorder. This is particularly true of neurasthenic people, and treatment of the tooth itself in such a case, with the idea of allaying the pain, would be futile. We must comprehend pathologic conditions and be able to determine the seat of the pain before we can apply intelligent treatment. If we know there is pressure on the nerve tract due to a growth in the bones through which the nerve passes, we may operate for its cure. If the pain is in the brain we may anesthetize the patient and secure temporary relief, or we can narcotize with a general nervous sedative and overcome pain by relieving the irritability in the brain. For pain due to irritation of the peridental membrane we can inject into the membrane a little cocain and temporarily relieve the pain, but this may not cure the trouble. We can also give a general anesthetic and anesthetize the brain so that our patient feels no pain. In other words, the exciting cause of pain, which may be anywhere in the nervous tract, must be reached to get permanent results. We apply these remedies to remove permanently the source of irritation if possible, but it is not always possible to do this, and as an expedient we must temporarily deaden the perceptive senses.

The first effort should be directed toward removing the local cause if possible, when the pain is of peripheral origin, thus pre-

venting its effect upon the cerebrum, and other possible systemic effects. This we might do by cutting the nerve which carries the pain stimulus to the brain, but this is not often practicable, since it destroys the physiological function of the nerve, and also because it is difficult to locate and isolate in the facial tissues the particular nerve involved; and it would necessarily involve other important nerves. It is, however, practiced in the extirpation of live pulps. Nerves are sometimes stretched, but this is also an extreme procedure. A much preferable method is to narcotize without shock either the nerve endings in the inflamed region of the cerebrum, or the nerve tract. Morphin has the property of narcotizing the nerve ends, its trunk and the perceptive centers in the brain, but has most influence on the brain centers. Atropin excites the brain centers while it narcotizes the nerve trunk, and particularly the nerve endings; when given internally it produces a depression of feeling at the periphery while the brain is excited. Because it produces this internal stimulation, atropin is usually classed as a systemic excitant. Cocain has largely the same centric action as atropin, but has a most powerful peripheral and local narcotizing action. Probably this is the most profound local narcotic we have, but has such stimulating effects on the brain that reflex impressions from other parts of the body will be greatly magnified, while the cocainized area will be obtunded. Cocain is a systemic poison only when it produces centric paralysis. Cocain has experienced a good deal of disrepute because careless operators have ignored these facts in using it; they have failed to employ it in such a way as to produce the greatest amount of local paralysis with the least amount of central excitement. To do this cocain must be used in sufficient quantity to completely paralyze the reflexes in the tissue upon which the operation is to be made. If only partly paralyzed a reflex shock results from the already excited brain centers, and sensations of hysteria with other disagreeable nervous and organic symptoms ensue. In such cases the blame is on the operator. Small but sufficient doses should be used and in the best way to secure the greatest amount of local paralysis. The disagreeable phenomena come from not recognizing the effects of the drug on the central system.

Chloral and gelsemium seem to have special influence on the fifth nerve; they are more used than any other remedies by the

medical practitioner in treatment of neuralgia of the head and face. They are not local anesthetics to the same extent as cocain, but are narcotics like morphin. We may use such remedies in preference to cocain to prevent central excitement. If the pain is from an inflamed pulp, and we cannot allay it by treating the latter, we should administer a drug having the desired systemic action. We may give morphin, for instance, until local applications have had time to produce the desired local effects. We can use chloral or morphin, for instance, while we use local applications to overcome acute pulpitis, and in this way prevent a destructive inflammation. We may also relieve local congestion and pain by the use of a cathartic which will give a revulsive effect, which acts by depleting the pulp and drawing away the circulation locally and similarly affecting the brain centers. A cathartic will cause excessive watery evacuations; a diaphoretic will cause the patient to sweat; thus we extract the water from the blood and relieve the congestion in the brain and the inflamed local area at the same time. By relieving the congestion in the tooth and in the brain at the same time and by a single remedy we produce a single purpose by a double action. This is probably the most satisfactory anodyne treatment for cases where prompt and complete effects are desired. Simply to apply a little oil of cloves or cocain to a highly-inflamed pulp perhaps reduces the pain locally, but leaves the brain centers irritated and excited, and reflex sensations from other parts of the body will cause recurrent pain and keep up the sensation in the brain, and may show its effects in other organs and tissues of the body, even to general systemic prostration.

Systemically we may cure toothache by mental diversion. The pain in the one brain center may be overcome by producing greater excitement in another part of the brain. By talking to people in an appropriate and pleasing way we may divert their minds from the subject of greatest interest to them at the time, so that they may not experience much pain from an otherwise painful condition. We may produce similar effects by physical or electrical shocks. By repeated applications of the electric current we may affect other parts of the brain and divert the pain long enough to permit recuperation or resolution, or it may be even dissolution in the diseased parts. We may use the cautery to cure toothache from an inflamed pulp or peridental membrane by producing a blister on some con-

tiguous tissue. The blister diverts the pain to a tissue which is capable of greater injury with less pain, and a depleting or revulsive action is also had. If we can produce on the cheek a more powerful irritation than that in the mouth, we can divert the sensation of pain to that part and give the diseased organ in the mouth a chance for resolution. We may also relieve painful conditions by applications which tend to produce physical change. By applying moist heat we can relieve tension and relax tissues and so prevent pressure on the nerve endings. Cold is sometimes used for the same purpose, not to relax tissues but to condense them, and keep them from becoming distended.

If we cannot overcome the toothache by any of these anodyne remedies we are compelled to resort to destructive surgical operations. We may extract the tooth; or if an alveolar abscess, we may lance, drain and sterilize it. These are to be classed as pain-relieving measures and within certain limits as anodyne treatments.

One of the most excruciating dental pains ensues from acute pericementitis, and its cause can usually be traced to inflammatory infection from a putrid pulp. In such cases no cure and little relief may be expected until the source of infection has been completely sterilized by instrumental or other therapeutic measures. The most common practice is the local application of a pepper plaster or a lotion of tincture of iodin, or it may be in severe cases a blister. Such always act as local remedies, with a nervous reflex action which has much to do with the successful application. This is the influence produced upon the vascular organs of the tissue implicated through the vaso-motor nerve impulses. By a reflex impulse there is greater tension upon the circulation involved, and consequently revived function. This reflex action is the most valuable feature in the use of local counter-irritants, but it is usually the case that purely local results are expected or looked for in the use of this class of remedies. It is commonly supposed that only a diversion of the blood-supply is secured in the use of counter-irritants, but the recuperative effect produced by the remedy on the perverted vascular functions through the nervous system is really the only true anodyne effect.

Another class of remedies having exactly opposite physiological reactions are the soothing or demulcent anodynes. These have no considerable physiologic reactions, but act in such a manner as to

relieve tension or irritation of the local sensitive nerves. In other words, they act mechanically to protect the exposed tissues and to prevent nervous excitement or stimulation. They are as a rule such agents as are insoluble, or if soluble are such as to produce slight excitement of function—oils, waxes, glucrites, mucilages, etc., will fairly exemplify this class. They find a much wider use in general medical than in dental practice. One class of these agents has a considerable and important use in dental practice; this includes the solutions of gummy and resinous substances in volatile solvents. These solutions may be applied to sensitive dentin, exposed pulps, etc., and upon evaporation of the volatile solvent there remains in contact with the sensitive tissue a more or less durable antiseptic protecting layer of inoffensive material which protects the sensitive structures from the mechanical irritation of its environment. At the same time it may be used as a medium to hold medicinal substances in direct contact with a diseased tissue for a sufficiently long period to secure curative action. Upon this principle rests the whole scheme of pulp dressings or cappings and treatment of sensitive dentin with cavity linings or varnishes, chloro-percha, carbolized resin, compound tincture of benzoin, and similar remedies, which are well-known medicinal examples. Generally these substances are used wholly as mechanical applications, but many of them possess good local anodyne qualities and all may be advantageously combined with chemical reagents of known power and value for curative purposes.

To this class may be added also those corrective and prophylactic remedies used in correcting the effects or influence of perverted secretions on the sensitive tissues of the mouth—anti-acid mouth washes, antiseptic lotions, and all measures used to prevent the progress of decay of the teeth or inflammatory irritation of the soft tissues. In this class the use of filling materials to prevent the progress of caries and to protect exposed dentin, as well as the use of insoluble escharotics like silver nitrate, are anodyne remedial agents of great value. In this connection it may be of value for us to take into more serious consideration than we are occasioned to do the varying qualities of our filling materials in respect not only to their durability and convenience of manipulation, but more particularly as to their usefulness in avoiding pain due to loss of the enamel or dentin, the natural protectors of the sensitive pulp organ.

Is it not time that our profession gives more attention to the relief of not only the unendurable pain of acute inflammation of the tooth organs, but to the less pronounced but continuous irritable conditions incident to thoughtlessness or carelessness in introducing improper filling materials into too close contact with sensitive dentin or pulp organs? Such conditions may produce, through the normal sensible reflexes, systemic conditions of a most serious character, and ought not to be overlooked in our efforts to produce more permanent and durable fillings. Because we are able by the use of efficient local anesthetics to make these operations painlessly, we should not lose sight of the possibility that conditions may result which will bring much suffering to our patients.—*Register.*

APPLIANCE TO HOLD COMPRESS IN HEMORRHAGE FROM TOOTH EXTRACTION. By James E. Power, D.M.D., Providence, R. I. On September 15, 1902, I was called to see Mrs. C., aged 32, by her attending physician, who had been trying to arrest a hemorrhage from the socket of the right second molar of the upper jaw. On arriving at the house I found the patient very weak, pale, and emaciated, with pulse hardly perceptible. She was very despondent, feeling positive that she was going to die; and considering her condition I decided that unless something were done immediately her prognosis would prove correct. I therefore proceeded to obtain a history of the case, which was as follows: Seven days previous to the above date she visited a dentist, who extracted the tooth before referred to; she then went home. The bleeding stopped, but during the night started again and was continuous until I operated. Further questioning convinced me that this patient was of the hemorrhagic type, as she said any injury to the tissues, whether caused by accident or surgical interference, was always accompanied by a hemorrhage which lasted from three to five days. In the present instance the physician had been trying to control the hemorrhage, but was successful only to the extent of three or four hours, when the substance with which he filled the socket would work out of position.

I now thoroughly examined the mouth of the patient, and by means of a probe introduced into the socket felt a small fragment of the palatal root, which had evidently been broken off during extraction of the tooth. The surrounding tissues were lacerated,

and a slow, steady hemorrhage was in progress. I advised immediate operation, and after consultation with the physician decided to operate under ether.

When the patient was thoroughly anesthetized I removed the broken root, which was about the size of a pea; then by means of a spoon-shaped curet smoothed all rough fragments of bone; made a deep groove in the bone, around the inside of the socket, and then irrigated thoroughly with full-strength hydrogen dioxid. I then saturated a large pledget of sterilized cotton with "Muraline" (which is an aluminum preparation), and under very great pressure forced it into the socket of the extracted tooth, and by the time the patient recovered the hemorrhage had stopped. I prescribed a mouth-wash. Visited patient every second day for seven days, and then removed the compress. This started a slight hemorrhage which, however, was easily controlled. Everything then progressed to a normal condition.

About three months afterward she visited me again, this time to be advised in regard to the extraction of the remaining upper teeth, which were the incisors, cuspids, bicuspids, and one molar. These were much broken down, the crowns and part of the tooth below the gingival line missing; some of the roots were abscessed, and patient was in constant pain. Remembering my previous experience, I decided that if some kind of an appliance could be made to hold a compress, and a certain degree of skill were exercised in the extraction of the teeth, the operation might be considered safe, and advised her accordingly.

Construction of Compress Holder. The first step was to make a compress holder, which I did in the following manner: I first took impressions of both jaws and made models, which I then put on an articulator, getting by this means the proper relations. I cut from the plaster model the teeth corresponding to the ones I intended to extract; then waxed over the lower teeth and on the ridge of the upper model put a form corresponding to the Gunning splint used for fractured jaws, and made an opening for the introduction of food. I vulcanized, finished and polished the same.

I placed the compress holder in the patient's mouth for trial, and after being satisfied that it fitted correctly made arrangements to proceed with the operation, which I did under ether as follows: Instead of extracting in the usual way, I grasped the root or tooth

firmly and very carefully twisted it out of the socket, being cautious not to injure the process any more than was unavoidable. I followed the method suggested when replanting is to be done. After extracting each tooth, and before beginning on the next one, under great pressure I forced into the socket a large pledget of sterilized cotton saturated with muraline. I followed this method on each tooth before proceeding with the next one (washing out each socket before packing), and waited for the patient to recover from the effects of the ether. I then took a strip of sterilized gauze, folded it over four times, saturated it with muraline, placed it across the ridge over the other compresses in the sockets, adjusted compress holder, and held the jaws together by a head bandage, which consisted of a skeleton head-cap, with bands running parallel with the rami of the jaws and across the chin, and a buckle on each band on the ramus, which allowed the jaws to be drawn firmly together.

After five hours hemorrhage was entirely controlled, and I removed the appliance the following day. I visited the patient every second day, and at the end of the fourth day removed the packing from one socket. This was accompanied by a slight hemorrhage which was easily controlled. I did likewise in the case of the other sockets, waiting in each case for from twenty-four to forty-eight hours. The same slight hemorrhage followed the removal of each compress, but it was easily controlled, and at the end of two weeks everything had returned to normal condition. In removing the compresses from the sockets I exercised great care, doing it very gradually, taking three or four minutes for each one. The patient is now wearing a temporary set of artificial teeth; is very happy and very grateful.

In using muraline under general anesthesia care should be taken that the patient does not swallow any, as it is an emetic and may cause the objectionable and serious complication which follows vomiting under general anesthesia.—*Cosmos.*

RETENTION OF PORCELAIN INLAY RESTORATIONS INCLUDING ANGLES OF INCISORS AND PROXIMAL MARGINAL RIDGES OF BICUSPIDS. By Jules J. Sarrazin, D.D.S., New Orleans. Read before the New Orleans Academy of Stomatology, May 27, 1903. In the use of a porcelain inlay for the restoration of the functional part of a tooth it is requisite, in order

that it may be retained while resisting the stress of mastication, that we adopt the same fundamental principles as have been advocated for metal contours. The adhesive properties of cement may be relied on where little morsal stress occurs. The quality of greater resistance will be needed to withstand severe force. It is true that oxyphosphate alone is utilized for compound fillings, regardless of any specially retentive form to the cavity, but it is likewise true that incisors frequently present with cavities of great depth where the floor at some portion may be wider than the orifice, and that compound cement fillings in molars, where the shape of the cavity is not retentive, will sometimes be dislodged by severe strain. It is now generally conceded by the most skillful and scientific operators in this country that successful restoration with metal, involving functional portions of the tooth, must depend on the step formation of cavities and on perfect molecular cohesion, whether the fillings be of gold or amalgam. Moreover, success in this class of work can be obtained only by full contouring of the contact points at or near the incisive portion of the teeth, so as to protect the soft tissues against irritation and the hard tissues against the results of impaction of food debris and lodgment of oral fluids. Full contouring necessarily requires adequate retention. These correct principles are as necessary in porcelain contours as where metal is used.

Methods of Retaining Porcelain Corners. These considerations have led the writer to the practice of a system of retention for porcelain inlays, founded upon the same requirements as those for metal, in order that there may be no hesitation in fully restoring contour. Nor is there any danger, if the work be carefully done, of weakening the porcelain itself. It may be that some writers on this subject are correct in claiming that even incisal angles or marginal ridges of bicuspids and molars may be retained simply by deepening the cavities in live teeth; by etching and grooving the cavity as well as the surface of the porcelain inlay, and by relying upon the adhesion of the cement without resorting to pulp devitalization in order to gain greater depth to the cavity. The latter method is at least open to the objection of unnecessary and dangerous approach to the pulps in order to produce means of retention, which apparently offers but little safety for extensive contours. Again it has been advocated to retain the contour by means of a staple of iridio-platinum wire baked in the inlay, extending from its inner surface into the deeper parts

of the cavity. This may be quite satisfactory in pulpless teeth, but when dealing with vital pulps will either become open to the same objection as above outlined, or will result in dangerous thinness of the porcelain itself. There appear to be good reasons for preserving the vitality of teeth whenever possible, especially when using porcelain. The inlay will not change color beyond receiving the superficial stains characteristic of the mouth, and this will only serve to make it more harmonious with the natural organs. On the other hand, the pulpless tooth will at least to some extent change color, or it will appear to do so on account of losing the translucency which is characteristic of its vitality; thus the inlay, which was well matched originally, will in time be conspicuous on account of the difference in shade.

Bicuspids and molars frequently present conditions of caries which will permit the step formation of cavities, the occlusal dovetail of the inlay being constructed of porcelain of sufficient breadth and thickness for safety, especially if the occlusion is properly studied before the cavity preparation, in order to avoid strain at or near the occlusal margins. This can be done by extension of the cavity when necessary.

The method which I will now describe is primarily applicable to incisors but may be used in bicuspids, and will furnish the necessary degree of retention to resist the stress of mastication for restorations of any size without danger of encroaching on the pulp by deepening the cavity and without weakening the inlay, provided the latter be properly constructed. A groove is cut horizontally in the lingual surface of an incisor not nearer than three thirty-seconds of an inch from the incisal edge. In this groove is fitted an iridio-platinum wire about twenty-three gauge. The wire is bent in a labio-gingival direction as it emerges from the groove into the approximal portion of the cavity, without approaching the axial wall of the cavity nearer than one forty-fifth of an inch at any part. The extremity of the wire which is to be inside of the porcelain is well rounded as is usual in such work. It is bent so as to permit a strong thickness of the porcelain between itself and the axial wall of the cavity, the object being that the procelain surrounding the wire shall be thick enough to resist stress. A good cervical seat should be provided.

Some conditions of occlusion will necessitate the placing of this lingual horizontal groove a little farther than three thirty-seconds

of an inch from the edge of the tooth, in order to avoid the impact of the incisal edge of the antagonizing tooth at or near the margin of the filling, so as to eliminate the danger of dislodgment by the stress thus brought to bear. The portion of the wire entering the groove of course is not covered with porcelain. The inlay thus made is cemented in the usual way. At some subsequent sitting the cement in the horizontal groove is burred away and replaced with cohesive gold. For obvious reasons the incisal step cavity which should be typical if the restoration were of gold is not utilized for porcelain, the horizontal lingual groove being used instead, because a compromise must be reached between the resistance of the filling as a whole and the strength of the porcelain itself. The same pulpal inclination toward the extremity of the floor of the groove should be produced as in metal work. For a proximo-occlusal contour, where the step cannot be made of procelain, a similar groove for the reception of the wire may be cut into the sulcus of the bicuspid, thus offering sufficient resistance without endangering the tooth and permitting correct restoration of the contact. The grooves must be cut to some depth for the retention of the wire in bicuspids, so that a thickness of nearly one-sixteenth of an inch of porcelain may exist between the morsal face of the filling and the point of entrance of the wire into the body of the inlay. Such depth of the step is not objectionable, being cement-lined and covered with gold. A good cervical seat is necessary.

The writer places little reliance upon the resistance of the bicuspid porcelain filling with a V-shaped morsal end held alone by the adhesion of the cement, when exposed to a strain of mastication. Similar construction with gold would result usually in fracture of one or more of the morsal angles, dislodgment of the filling, or at least fracture of the enamel margins of the cavity. In the use of porcelain these accidents, with the exception of the dislodgment of the filling, would not perhaps be invited, as there would be no undercutting in the buccal and lingual cavity walls. In spite of the cervical seat the resistance of the filling, however, would merely depend upon the adhesion of the cement, and with a V-shaped morsal opening this would be a poor reliance. A reliable adhesive surface requires that the cavity increase mesio-distally in the morsal third in direct ratio to the size of a contour, and the reverse is the case in applying to cuspids, bicuspids and molars.—*Items.*

HAND PRESSURE IN THE INTRODUCTION AND CONDENSATION OF COHESIVE GOLD FILLINGS. By Alonzo Milton Nodine, D.D.S. Read before the Second District Dental Society, March, 1903. It is admitted by most operators that hand pressure possesses not a few advantages, but that this method also has its distinct disadvantages. The question naturally arises, are the advantages sufficient for it to be used in preference to the automatic mallet in a majority of cavities and in the major part of nearly all cavities? The attempt will be made to answer this question. First. Gold may be packed into undercuts with less liability to displacement. Second. Gold may be lapped over the cervical margin of a cavity, getting closer adaptation, with less liability of fracturing the enamel. Third. Gold may be more closely adapted to the irregularities of the surface of the tooth structure. Fourth. Gold may be condensed over cement cappings and linings with less danger of fracturing the cement. Fifth. Gold may be condensed against frail walls with less danger of fracturing them or checking the enamel. Sixth. Gold may be packed in cavities not accessible to the automatic mallet, particularly disto-approximal cavities in molars and bicuspids. Seventh. The danger of displacing a filling by a misdirected blow is much less. Eighth. The jar upon the tooth and patient is not nearly as severe. Ninth. Hand pressure can produce a filling nearly as dense as one made by mallet force; often one equally as dense and again others that are even denser; this depends upon the operator and the form of gold. Tenth. The gold remaining more cohesive, there is less flaking of it.

The statement has been made by several authorities that cohesive gold fillings inserted by hand pressure in holes in a steel plate are not as dense as those made by mallet force. Here are two fillings, one inserted by hand pressure, the other by the automatic mallet, using the same form of gold. The filling made by the mallet was composed of smaller pieces of gold. (Exhibits fillings.) These advantages result from the fact that in condensing the gold there is no sudden impact to spring the gold, no penetrating blow to pierce the gold and injure the margins; instead there is a steady pushing and rocking motion that works the gold into the inequalities rather than driving it in.

In a paper written by Dr. Black in 1895 are the results of a series of experimental fillings, made by several operators using different methods. There were but two operators who used cohesive gold

and also used mallet force in one cavity and hand pressure in the other. Dr. S. inserted three fillings, one using hand pressure, getting a specific gravity of 12. One using the automatic mallet (each piece of gold receiving twenty-five blows) specific gravity of 12.5. One using the automatic mallet (each piece of gold receiving fifty blows) specific gravity of 14.0. Dr. H., using hand pressure, getting specific gravity of 16.9; using hand mallet (50 blows upon each piece of gold) specific gravity of 17.4.

Dr. Black read a paper in 1896 in which were given the results of other experimental fillings. There was but one operator using cohesive gold, who also used hand pressure in one cavity and mallet force in the other. Dr. J. F. P. Hodson produced with hand pressure, using Watts's gold, a filling having a specific gravity of 17.76, and one with the automatic mallet getting a specific gravity of 18.05.

Dr. Johnson in his work on "Operative Dentistry" says of fillings inserted by hand pressure: "While they are not as dense, they usually succeed in saving the teeth. They do this by reason of good adaptation to the cavity walls." Further he says, "It is not the hardest worked gold filling that is always the best, but the one most closely filling the walls of the cavity and which is the most uniformly packed."

Dr. Ottolengui in "Methods of Filling Teeth" says, "The greatest good gained by hand pressure is that the gold remains more cohesive under hand pressure than in connection with any other. The more gradual the pressure exerted upon gold foil in condensing it the less it loses its quality of cohesiveness, and vice versa, the more sudden or rapid the blow of the hammer, the less cohesion will be exhibited."

Dr. Louis Jack in the "American System of Dentistry" in mentioning the three steps in condensing gold by hand pressure says, "The third movement is one of leverage, which, being one of the powerful mechanical forces, is more efficient in effecting consolidation than the greatest amount of direct force applicable could be. It has been shown that great force is not needed to bring about the cohesion of gold when it has been correctly prepared. The gold is laid upon the part with some direct pressure, which is immediately followed by a tilting or rocking movement of the instrument. This produces leverage in which one corner of the instrument is the fulcrum, and the other coming down with energy overcomes the irregularities of the surface and also produces contact and therefore union."—*Items.*

The Dental Digest.

PUBLISHED THE FIFTEENTH DAY OF EVERY MONTH
At 2231 Prairie Avenue, Chicago,
Where All Communications Should be Addressed.

Editorial.

INSTITUTE OF DENTAL PEDAGOGICS.

We would call the attention of our readers to this organization, a full program of whose coming meeting was published in the October issue. It is true that its papers might not appeal to the average dentist, but every member of the profession is or should be interested in the objects and ideals towards which it is striving. We outlined its work in detail in our January, 1903, issue, so will not here repeat, but we would again commend the organization and call the attention of the entire profession to its work. The Institute of Dental Pedagogics, although young and small in numbers, is one of the most important dental organizations, and it fills a place that no other attempts, namely, to better prepare the teachers in dental colleges to do their work well. We publish in this issue a paper read before the last meeting, which will give an idea as to the class of matter presented. This is probably the only dental organization in the United States where men are selected to read papers because of their peculiar knowledge of or fitness for the work, and where those who discuss these papers are chosen for the same reasons. Furthermore, every man in attendance is interested in each paper and competent to a degree to take part in the discussion. These facts alone make the work of the Institute unique and worthy of commendation. The objects of the organization are purely educational, politics, legislation, and such other matters having no place in its deliberations. Its influence will be seen in better prepared students and the importance of its work cannot be overestimated.

INCOMES OF DENTISTS AND PHYSICIANS.

Some time ago a dentist in a small New Jersey town made comparisons between the incomes of dentists and physicians in two small but prosperous towns in that state. In one the two dentists

averaged $800 a year each, and the four physicians averaged $3,000 each, and in the other four dentists averaged $1,000 each and six physicians averaged annually over $4,000 each. A Chicago physician recently prepared a table of statistics showing that the income of the average physician of Chicago varied from $1,500 to $3,000 per year, while the specialists fared much better. A prominent medical journal recently stated as its belief that not more than one per cent in the medical profession made more than a day-to-day livelihood. Other medical journals have discussed the subject, and all agree that the incomes of physicians throughout the country, but especially in the large cities, have been steadily decreasing for some years. Two chief causes are ascribed for this condition—first, overcrowding of the profession, and second, the abuse of medical charity in the dispensaries and hospitals. Investigation by the New York Charitable Society shows that 50 per cent and in some localities 80 per cent of the applicants at medical dispensaries are unworthy of the charity. One journal in particular blames the medical profession for the existence of this abuse, stating that too many physicians have shown a feverish anxiety to see their names connected with some hospital or dispensary, until, as Mark Twain once said of the decoration of the Loyal Legion in France, "Few, indeed, have escaped." The natural result of this has been a multiplication of these institutions and a keen competition for patients.

The dentist's income should be larger than that of the physician, as his office expenses are higher, his equipment larger and a good share of his fee is simply payment for the material used. In spite of these facts, however, the income of the average dentist is not so great as that of the average physician, which is certainly small enough. Furthermore, the current belief is that dental as well as medical fees are decreasing, but we are not sure enough of this to make a definite statement. We intend, in the near future, to discuss this matter of fees and to suggest remedies, and our principal object in writing this editorial is to arouse interest in the subject and to ask help of the profession in obtaining definite information, which will be of great value and interest. We earnestly request each one of our readers to help us in the work, and what we want him to do is this, namely, go over his account books for the past few years and see whether his income has increased or decreased during that period, and give reasons therefor. Second, to interview a few

physicians of his acquaintance and see how their incomes compare with his own. All such information will be treated in strict confidence, and no names will of course be mentioned, nor even the names of towns if so desired.

Notices.

PENNSYLVANIA ASSOCIATION OF DENTAL SURGEONS.

The fifty-seventh annual meeting of the Pennsylvania Association of Dental Surgeons was held at Philadelphia, Oct. 10, 1903, and the following officers were elected: Pres., Wilbur F. Litch; V.-P., M. I. Schamberg; Secy., J. C. Salvas; Treas. and Librarian, Wm. H. Trueman.

J. CLARENCE SALVAS, Secy.

NORTHWESTERN UNIVERSITY DENTAL SCHOOL ALUMNI ASSOCIATION.

The annual clinic of the Alumni Association of Northwestern University Dental School will be held at the University Building, Lake and Dearborn Sts., Chicago, Jan. 19, 1904. All members of the profession are cordially invited to attend.

E. B. JACOBS, President. G. B. MACFARLANE, Secy.

INDIAN TERRITORY DENTAL ASSOCIATION.

The Indian Territory Dental Association was organized at South McAlester, Nov. 18, 1903, and the following officers were elected: Pres., J. E. Wright, So. McAlester; V.-P., C. W. Day, Vineta; Secy., J. G. Abernathy, Ardmore; Sup. of Clinics, A. E. Bonnell, Muskogee. The next meeting will be held at Muskogee, May 4-5, 1904.

NATIONAL DENTAL ASSOCIATION, SOUTHERN BRANCH.

The annual meeting of the Southern Branch of the National Dental Association will be held in Washington, D. C., Feb. 23-25, 1904. An excellent program is being prepared, and a most interesting and profitable meeting is assured. Washington is an ideal meeting place as well as a very interesting city.

CARROLL H. FRINK, Cor. Secy., Fernandina, Fla.

INSTITUTE OF DENTAL PEDAGOGICS.

A complete program of the meeting to be held in Buffalo, Dec. 28-30, 1903, at the Iroquois Hotel, was printed in the last issue of the DIGEST. Owing to the death of Dr. Taft, Dr. H. L. Ambler, who was to have opened the discussion on Dr. Taft's paper, has rearranged his discussion and will present the paper. Dr. George E. Hunt will present a paper instead of Dr. Barrett.

The importance of this organization and its work cannot be overestimated, and every one interested in dental education is urged to be present at this meeting.

W. H. WHITSLAR, Chairman Ex. Com., 700 Scofield Bldg., Cleveland.

IN MEMORIAM.—DR. W. C. BARRETT.

WHEREAS, In the fullness of time, having lived nearly the allotted three score years and ten, our friend and associate, William Carey Barrett, departed this life on August 22, 1903. Death is the anticipated end of man and we rejoice that our beloved brother sleeps the sleep that knows no waking, in the full consciousness that he had performed all the duties of life in a manner that we, his associates, may strive to emulate. May his spirit rest in peace.

Therefore be it resolved, That the members of the Odontological Society of Chicago, in full meeting assembled, testify their belief in the upright character and devotion to principles of their brother, W. C. Barrett, and they one and all mourn his sudden taking off. This society tenders to his family and friends their sincere condolence, and it is ordered that a page be set apart in their record book to permanently preserve this note for all time, and that a copy be sent to the leading dental journals for publication, and one to the widow of our friend.

A. W. HARLAN,
TRUMAN W. BROPHY,
JOSEPH W. WASSALL,
Committee.

RESOLUTIONS ON DEATH OF DR. ODELL.

The following resolutions were adopted at a meeting of the First District Dental Society of the State of New York, November 10, 1903:

Whereas, on October 11, 1903, Francis M. Odell, M. D., D. D. S., an honorary member of this society and its secretary for some years in its early days, started on that unknown journey,

Resolved, that we, the members of the First District Dental Society in regular session assembled, testify to the loss we feel in his departure from our midst;

To the loss the community has sustained since he has ceased to be able to give them the benefit of his well trained mind and his skillful hand;

To his skill which has preserved thousands of human teeth to remain a comfort to his former patients in their old age, which in itself is the highest praise we can bestow;

That we appreciate the work he has done for this society, and the scientific advancement of dentistry during his active career;

That the fortitude and patience he displayed during the last ten years of his life, constantly battling with a dread disease which not only prevented his practising his profession but entailed untold suffering, make his character stand out in a manner most creditable and worthy of emulation;

That we condole with his bereaved family; that a copy of these resolutions be sent to his widow, to the dental journals, and also be inscribed on our official minutes.

S. L. GOLDSMITH,
W. E. HOAG,
M. L. RHEIN,
Committee.

A GOLDEN ANNIVERSARY CELEBRATION.

CLASS OF 1854, PHILADELPHIA COLLEGE OF DENTAL SURGERY.

The dental profession of Philadelphia, represented by all of its organizations, will celebrate on February 27, 1904, the fiftieth anniversary of the graduation of the Class of 1854 of the Philadelphia College of Dental Surgery by a complimentary banquet to the surviving members of the class, consisting of Drs. LOUIS JACK, JAMES TRUMAN, C. NEWLIN PEIRCE, and W. STORER HOW.

All dentists in good standing are invited to participate. The subscription price, including a banquet ticket and one copy of the souvenir historical volume to be published in commemoration of the event, has been fixed at ten dollars. The subscription list will be open until February 10, 1904.

The committee in charge of the celebration consists of the following members:

Edwin T. Darby.
Edward C. Kirk,
R. H. D. Swing,
Albert N. Gaylord,
Earl C. Rice,
I. N. Broomell,
J. T. Lippincott,
L. Foster Jack,
G. L. S. Jameson,
J. D. Thomas,
Wilbur F. Litch,
H. C. Register,
Wm. T. Trueman,
Robert Huey,
Wm. L. J. Griffin,
J. Clarence Salvas,
D. N. McQuillen.

Applications together with the subscription may be forwarded to the chairman of the Invitation Committee,

ROBERT HUEY, D. D. S.,
330 S. Fifteenth st., Philadelphia.

FOURTH INTERNATIONAL DENTAL CONGRESS,

St. Louis, August 29 to Sept. 3, 1904.

COMMITTEE ON STATE AND LOCAL ORGANIZATIONS.

J. A. Libbey, Chairman, 524 Penn Avenue, Pittsburg.

The Committee on State and Local Organizations is a committee appointed by the Committee of Organization of the Fourth International Congress with the object of promoting the interests of the Congress in the several states of the Union. Each member of the committee is charged with the duty of receiving applications for membership in the Congress under the rules governing membership as prescribed by the Committee on Membership and approved by the Committee of Organization. These rules provide that *membership in the Congress shall be open to all reputable legally qualified practitioners of dentistry.* Membership in a state or local society is not a necessary qualification for membership in the Congress.

Each state chairman, as named below, is furnished with official application blanks and is authorized to accept the membership fee of ten dollars from all eligible applicants within his state. The state chairman will at once forward the fee and official application with his indorsement to the chairman of the Finance Committee, who will issue the official certificate conferring membership in the Congress. No application from any of the states will be accepted by the chairman of the Finance Committee unless approved by the state chairman, whose indorsement is a certification of eligibility under the membership rules.

A certificate of membership in the Congress will entitle the holder thereof to all the rights and privileges of the Congress, the right of debate, and of voting on all questions which the Congress will be called upon to decide. It will also entitle the member to one copy of the official transactions when published, and to participation in all the events for social entertainment which will be officially provided at the time of the Congress.

The attention of all reputable legally qualified practitioners of dentistry is called to the foregoing plan authorized by the Committee of Organization for securing membership in the Congress, and the Committee earnestly appeals to each eligible practitioner in the United States who is interested in the success of this great international meeting to make application at once through his state chairman for a membership certificate. By acting promptly in this matter the purpose of the committee to make the Fourth International Dental Congress the largest and most successful meeting of dentists ever held will be realized, and the Congress will thus be placed upon a sound financial basis.

Let everyone make it his individual business to help at least to the extent of enrolling himself as a member and the success of the undertaking will be quickly assured. Apply at once to your state chairman. The state chairmen already appointed are as follows:

General Chairman—J. A. Libbey, 524 Penn Ave., Pittsburg.

States.

Alabama. H. CLAY HASSELL, Tuscaloosa.
Arkansas. W. H. BUCKLEY, 510½ Main St., Little Rock.
California. H. P. CARLTON, Crocker Bldg., San Francisco.
Colorado. H. A. FYNN, Denver.
Connecticut. HENRY MCMANUS, 92 Pratt St., Hartford.
Delaware. C. R. JEFFRIES, New Century Bldg., Wilmington.
District of Columbia. W. N. COGAN, The Sherman, Washington.
Florida. W. G. MASON, Tampa.
Georgia. H. H. JOHNSON, Macon.
Idaho. J. B. BURNS, Payette.
Indiana. H. C. KAHLO, 115 E. New York St., Indianapolis.
Iowa. W. R. CLACK, Clear Lake.
Kansas. G. A. ESTERLY, Lawrence.
Kentucky. H. B. TILESTON, 314 Equitable Bldg., Louisville.
Louisiana. JULES J. SARRAZIN, 108 Bourbon St., New Orleans.
Maryland. W. G. FOSTER, 813 Eutaw St., Baltimore.
Massachusetts. M. C. SMITH, 3 Lee Hall, Lynn.
Michigan. G. S. SHATTUCK, 539 Fourth Ave., Detroit.
Minnesota. C. A. VAN DUZEE, 51 Germania Bank Bldg., St. Paul.
Missouri. J. W. HULL, Altman Bldg., Kansas City.
Nebraska. H. A. SHANNON, 1136 "O" St., Lincoln.
New Jersey. ALPHONSO IRWIN, 425 Cooper St., Camden.
New York. B. C. NASH, 142 W. 78th St., New York City.
North Carolina. C. L. ALEXANDER, Charlotte.
Ohio. HENRY BARNES, 1415 New England Bldg., Cleveland.
Oklahoma. T. P. BRINGHURST, Shawnee.
Pennsylvania. H. E. ROBERTS, 1516 Locust St., Philadelphia.
Rhode Island. D. F. KEEFE, 315 Butler Exchange, Providence.
South Carolina. J. T. CALVERT, Spartanburg.
Tennessee. J. P. GRAY, Berry Block, Nashville.
Texas. J. G. FIFE, Dallas.
Utah. W. L. ELLERBECK, 21 Hooper Bldg., Salt Lake City.
Virginia. F. W. STIFF, Richmond.
West Virginia. H. H. HARRISON, 1141 Main St., Wheeling.
Wisconsin. A. D. GROPPER, 401 E. Water St., Milwaukee.

For the Committee of Organization,
EDWARD C. KIRK, *Secretary.*

News Summary.

PHYSIC beats the faith cure because it has the inside track.

T. N. MCGUIRE, a dentist at New London, Conn., died Nov. 6, 1903.

F. SADTLER, a dentist at Louisville, died Nov. 3, 1903, from typhoid fever.

H. J. LEE, a dentist at La Crosse, Wis., was adjudged insane Oct. 29, 1903.

G. H. SNOW, 61 years old, a dentist in New York, died suddenly Oct. 30, 1903.

C. L. SEIBERT, 66 years old, a dentist at Mercersburg, Pa., died Oct. 28, 1903.

R. D. O'NEILL, a dentist at Pittsburg, died suddenly Oct. 26, 1903, from alcholism.

SOME MEN'S POPULARITY is due to the fact that they don't think out loud.—*Alk. Clinic.*

G. W. FARRINGTON, a dentist of San Francisco, died Nov. 2, 1903, after a long illness.

JOSEPH J. BUSCH, 28 years old, a dentist of Chicago, was declared insane Nov. 19, 1903.

T. F. KING, 57 years old, a dentist at Easton, Pa., died Oct. 27, 1903, from heart disease.

J. A. MONTGOMERY, a dentist at Douglas, Ga., died Oct. 27, 1903, from typhoid fever.

CHARLES H. THAYER, in the practice of dentistry in Chicago since 1870, died Nov. 3, 1903.

M. L. JACKSON, 74 years old, a dentist at Oskaloosa, Ia., died Nov. 7, 1903, from heart disease.

T. F. MCCORMICK, 66 years old, a retired dentist at Cincinnati, died Nov. 2, 1903, from consumption.

E. W. LIGHT, a dentist at Saginaw, Mich., killed his wife and daughter and committed suicide Nov. 8, 1903.

A. S. HODGE, for many years in the practice of dentistry at Maquoketa, Ia., died Nov. 13, 1903, after a long illness.

J. A. FINERTY, 30 years old, a dentist of Buffalo, died at El Paso, Tex., Nov. 4, 1903, from pulmonary hemorrhage.

R. W. JOYNER, for over thirty years in the practice of dentistry at Wilson, N. C., died Nov. 10, 1903, after a long illness.

BANKRUPT.—Arthur H. Palmer, a dentist of Pasadena, Cal., filed a petition in bankruptcy Nov. 13, 1903, listing his debts at $20,374, and his assets at $1,409.

PROBERT FINED.—Arthur C. Probert, to whom we have had frequent occasion to make reference, was fined $500 and costs Nov. 21, 1903, for fraudulent use of the mails.

HALF OUR MEDICAL JOURNALS are not worth the printed paper. It would be charity and kindness to discontinue them. W. J. Robinson, *Alk. Clinic.*—How about dental journals?

SOUTHEASTERN IOWA DENTAL ASSOCIATION was organized at Muscatine, Oct. 27, 1903, and the following officers were elected: Pres., C. H. Sterneman; Secy., A. A. Peterson.

REPLANTATION.—A dentist in Pennsylvania advertises "Teeth extracted

and cleaned free with all dental operations." It is of course understood that he will put the teeth back.

NEW DENTAL TERMS.—According to newspaper report we learn that a paper was recently read in Delaware on "Evasion," and that a paper was presented in Connecticut on "Oral Propylctis."

CEDAR RAPIDS (IA.) DENTAL ASSOCIATION held its annual meeting Oct. 23, 1903, and elected the following officers: Pres., C. B. Whelpley; V.-P., J. H. Calder; Secy., C. N. Booth; Treas., F. E. Miller.

NURSE STEALS TO PAY DENTIST.—A nurse in Philadelphia recently stole money from the hospital where she was employed to pay her dentist. It is a pity all our patients haven't the same zeal at least.

DIVORCES.—Eva Lane was granted a divorce from Charles B. Lane, a dentist of San Francisco, Nov. 10, 1903, on the ground of neglect.—C. Lilian Warner has filed suit for divorce against C. P. Warner, a dentist of Sacramento, Cal.

BUTTE (MONT.) DENTAL SOCIETY was organized Nov. 9, 1903, and the following officers were elected: Pres., S. Keyser; V.-P., B. J. Keenan; Secy., E. J. Rinckel; Treas., F. Bimrose; Board of Directors, A. C. Sanberg; G. A. Chevigny and T. Quirk.

FATALITIES.—Nov. 2 a woman at Sharon, Ill., died in a dentist's chair while under the influence of chloroform.—Nov. 16 a woman at Mendota, Ill., died in a dentist's chair while under the influence of chloroform which was administered by her physician.

INITIATION FATAL.—A dental student in Maryland died Nov. 15 from the effects of brutal hazing by fellow students at a Greek letter society initiation. If the authorities would hang some of the hazers in one of these brutal affairs it would stop the practice for all time to come.

ROBBERIES.—George F. Barrett, Hartford, Conn., Nov. 6, $60.—H. C. Pence, Taylorville, Ill., Nov. 6, $25.—Wm. H. Thrower, Oelwein, Ia., Nov. 4, $50.—C. E. Whitesides, Paducah, Ky., Nov. 17, $30.—W. I. Boynton, Springfield, Mass., Nov. 6, $40.—Frantz & Baxter, Greensburg, Pa., Oct. 24, $50.

A MAN to whom illness was chronic,
When told that he needed a tonic,
Said, "Oh, doctor, dear,
Won't you please make it beer?"
"No, no," said the doc, "that's Teutonic."—*Princeton Tiger.*

GERMANY FINES AMERICAN DENTIST.—A dentist in Germany was recently fined $750 for practising dentistry without proper qualifications. He exhibited a diploma from the German-American Dental College of Chicago, but the authorities would not recognize it. He was fined $75 in the local court, and appealed, but the higher court "saw" him and "raised" him.

EXAMINING BOARD AFFAIRS.—At the October meeting of the California Board the following officers were elected: Pres., C. A. Herrick, Jackson; Treas., J. M. Dunn, San Francisco; Secy., F. G. Baird, San Francisco. The next examination for licenses will be held May 23, 1904, in San Francisco.—

At the November meeting of the Oregon board 11 applicants passed the examination.—At the November meeting of the Washington board 22 out of 42 applicants were successful. Each one signed an agreement to abide by the code of ethics set forth by the National Dental Association.

SEALING AN ARSENICAL APPLICATION.—A. W. Thornton, Chatham, Ont., in *Review.* A pledget of cotton dipped in chloro-percha of a creamy consistence makes a soft material with which to seal an arsenical application in a tooth.

AN EVEN BREAK.—"Don't you find it expensive running to a doctor so often?" asked Wellum of Sickum. "No. You see he always puts me on a diet, and I save enough on my meat and grocery bills to more than pay his."

ROOT-CANAL FILLINGS.—W. H. Dwight, *Cosmos.* Dissolve gutta-percha in chloroform and add oil of eucalyptus; stir until it unites. Allow the chloroform to evaporate, leaving the gutta-percha held by eucalyptus. If it gets too stiff a little heat will soften it.

THE LONGER THE BETTER.—"I see Boston people eat pie in the morning and New Yorkers have it at night. Which do you think the better way, doctor?" "Well, I should say the New York style. The longer a man puts off eating pie the better it is for him."—*Yonkers Statesman.*

FAR-SIGHTED DRUGGIST.—"Is there any profit in selling postage stamps?" inquired the man in search of information. "Not directly," replied the druggist, "but it gets people into the habit of going to the drugstore, and after that it doesn't take long to make chronic invalids of them."—*Puck.*

CHLORAL HYDRATE AS A VESICANT.—When a marked effect is rapidly required chloral hydrate is better than cantharides and has none of its disadvantages. With children, next to iodin, it is the counter-irritant of choice. The blister will produce erythema, vesication, or ulceration, as desired.—*Montreal Med. Jour.*

HALE'S EPITOME OF ANATOMY. A Manual for Students and Physicians. By Henry E. Hale, A. M., M. D., Assistant Demonstrator of Anatomy, College of Physicians and Surgeons (Columbia University), New York. In one 12mo volume of 384 pages, with 71 illustrations. Cloth $1.00, net. Lea Brothers & Co., Publishers, Philadelphia and New York, 1903.

STAINLESS IODIN; GLYCEROL OF IODIN; FOR LOCAL APPLICATION.—T. W. Williams, *American Medicine.* Glycerin as an excipient for iodin, instead of alcohol, has the advantage of leaving no stain on the skin and of producing only slight local irritation, while absorption is more complete. It cannot be used as freely as the tincture, because it produces symptoms of iodism more quickly.

RHYTHMICAL SUBLUXATIONS OF THE LOWER JAW TO PREVENT CHLOROFORM SYNCOPE—C. Valery (*Gas. des Hopitaux. Treatment*) recommends at regular intervals throughout narcosis the pulling of the lower jaw forward and upward. If this be done, and the light reflex be not abolished, there is no danger. The method insures regular breathing and helps to remove any mucous collection.

DENTIST WINS SUIT.—In the August issue we reported that a dentist at Leavenworth, Kas., had sued a woman patient for $73 for two sets of teeth which he had made for her, and that the court allowed him $38, the price of one set, and the cost of the suit. The woman appealed the case, and Nov. 13 a jury allowed the dentist his full bill and ordered the woman to also pay the costs in the case, the total amount being $125.

PAINLESS APPLICATIONS OF MERCURY BICHLORID SOLUTIONS TO MUCOUS MEMBRANES.—Despierris (*Journal des Praticiens*) states that, while it is known that aqueous solutions of from 1:4,000 to 1:10,000 of corrosive sublimate are very painful when applied to the nasal mucous membrane, if these solutions are combined in a proportion of about 2 drams to 1,000 parts of sodium chlorid, they do not cause the slightest pain when applied to mucous membranes.

HEMORRHAGE AFTER EXTRACTION.—In checking a stubborn hemorrhage the quickest plan is always the best. I have never had a failure with the following method—to a tumbler half full of water add three grains of tannic acid and give internally two tetspoonfuls, with fifteen drops of fluid extract ergot, every five minutes until three doses have been taken, and then once every fifteen minutes until checked. At same time use in socket a cotton plug with any of the ordinary styptics.—*W. S. Walters,* Lafayette, Ind.

"PHYSIOLOGICAL"—ITS TRUE MEANING.—W. H. Birchmore (*Items*). Many men who write, and some men who actually think before writing—most men do afterward, if ever—are altogether too prone to use the word "physiological," especially when coupled with the word "condition," as though it were an expression of an actual instead of an ideal state. Were conditions ideal, disease would long ago have been a tradition simply. In fact, physiological means only that the conditions are not incompatible with usefulness.

ZINC DIES OF MODELS WITH DEEP UNDERCUTS.—By Hermann Muller (*Archiv fur Zahnh.-Cosmos*). After preparing a plaster model with a high base, the teeth are cut off and the model is rubbed vigorously with talcum powder and painted over with water-glass. The model is then placed upon a piece of glass and a mixture of plaster, molding sand and pumice is poured over it. This cap is allowed to dry for twenty-four hours, when it is removed by lightly hammering the model. The pieces of this cap are then set together on moist sand, when the metal is poured into it.

GUMS AND TEETH IN DIABETES.—Talbot states that the gums and teeth are very early affected in diabetes. The alveolar process, being a transitory structure, readily yields to any toxemic state. As the arteries terminate at the base of the teeth, they readily decay. The vinous odor of diabetes may occur in the mouth long before other conditions are evident. The early shrinkage of the alveolar process and gums at the outset of diabetes and of diabetic coma was pointed out by Tyson two decades ago. The condition of the gums antecedent to toxemic states deserves further study.—*Medical News.*

POROUS RUBBER DENTURES.—Porous plates are usually attributed to improper vulcanization. There is another cause, however, which should not

be overlooked. The mold in which the rubber is packed must be made strong enough to resist the pressure caused by the expansion of the gas which is formed during the process of vulcanization. If the plaster in the flask is not dense and hard it will be forced back, and there being no pressure to drive out the gas as it is formed, the result is a porous plate. The plaster for flasking should be mixed with as much care as for making models.—*Review.*

Adhesive Plaster or Collodion versus Stitches in Mouth-Wound.—When a wound is situated in a place in which constant motion is going on, such as the angles of the mouth, it is always best if possible to avoid using stitches, as they tear out easily under such circumstances. Adhesive plaster or collodion will generally prove to be the best means of approximating the severed parts.—*Internat. Jour. of Surgery.*

Treatment of Thrush by a Sucking-bag.—Escherich (*Le Nord Médical—Cosmos*). Take a tampon of aseptic cotton, impregnate it with powdered boric acid and a little saccharin, inclose in a silk or cambric sac, sterilize, and place in the infant's mouth. Under the influence of sucking, the boric acid slowly dissolves and so has a direct and continuous action on the saccharomyces albicans. If the fungus growth is extensive this treatment may be supplemented by buccal irrigations. A very prompt cure results.

Root-Canal Filling for Neurotic Patients.—Joseph Head, *International.* In the case of neurotic patients, where there is a tendency to pericementitis, it is wise to defer filling the canal to the second visit, placing cotton well soaked in carbolic acid in the canal, and while the stump of the pulp is still under the influence of cocain drive the cotton directly on to the stump to scar it. At the next visit the canal will be found quite insensitive at the apex. To avoid putrescence I fill the apical portion with mummifying paste for one-eighth of an inch.

To Electro-Gild Orthodontia Appliances, Etc.—J. Q. Byram, Indianapolis, in *Review.* Make a solution by dissolving ammonium carbonate and potassium cyanid, each one ounce, in one pint of rain water. Attach the appliance to the zinc pole and a piece of pure gold to the carbon pole of any form of cell battery. Place the solution in a porcelain pan over a low flame, allowing it to boil slowly. Keep the appliance and gold in the solution from ten to fifteen minutes. The appliance will come out with a dark brown color, but after brushing it with a stiff brush filled with sodium bicarbonate it will have a rich gold color.

Keep Women Out for Their Own Sakes.—Professor Zimmer of Berlin has been investigating the causes of insanity among women, and has come to the conclusion that if women are admitted into competition with men the inevitable result will be a tremendous increase of insanity among the women. He finds that the percentage of women teachers who become insane is almost double that of the men teachers. Inquiries were also made about women employed as telegraph and sales clerks, and in the telephone service, and, furthermore, with regard to women engaged in the Swiss watchmaking trade. These inquiries showed that in the occupations mentioned a far larger

proportion of women than men succumb to mental disorders.—*Medical Times.* —From a hasty investigation we should say this is also true of women who enter the dental and medical professions.—Ed. DIGEST.

REDDENING OF CARBOLIC ACID.—F. T. Gordon (*Western Druggist*) sets forth that recent investigations indicate that the cause of the reddening of carbolic acid is the ozone or hydrogen peroxid of the air acting in the presence of iron, derived from the glass of the bottles or the tin of containers. Like the coloration of resorcin and hydro-quinone, this reddening is the effect of the two substances, iron and hydrogen peroxid, acting together; the latter is formed from the slow oxidization of the iron (in bottles or in the substance itself) in the presence of air and moisture. Experiments corroborate this theory.

ON THE ETIOLOGY OF NOMA.—As the bacteriological examination of the patients of Dr. Korsch (*Bolnit. Gaz. Bot., Medical News*) showed the presence, among others, of the diphtheria bacilli, he added to the usual course of treatment an injection of diphtheria antitoxin, after which the ulcerated area began to cover itself with healthy granulations, and the patient's general condition to improve. Though the diphtheria bacillus may be only a secondary factor in the etiology of noma, still the author thinks that it is certainly not an indifferent agent, and, consequently, whenever it is found, antitoxin should be added to the rest of the treatment.

TURPENTINE AS AN ANTISEPTIC.—According to the *Medical Record,* glycerinated turpentine may be used with success as an antiseptic in the treatment of wounds. Dr. Kossobudsk fills a sterilized bottle with glycerin and adds a small quantity of turpentine. This should be well shaken and allowed to stand for two days. Then he adds a small quantity of five per cent solution of hydrogen dioxid. It is then ready for use. As an antiseptic it checks excessive secretion when applied to wounds, relieves pain and swelling, and promotes the healing process. This action is thought to be due probably to the oxygen liberated, and partly to the properties of the turpentine.

OBTUNDENT.—Continuously we hear about new local obtundents for the painless excavation of hypersensitive dentin. Here is a combination of drugs that is second to none: Melt together in a test-tube equal parts of menthol and cocain hydrochlorate and add an equal amount of liquid carbolic acid. Keep in well-stoppered colored bottles. Before applying the heated solution to the dentin the cavity should be washed with a warmed alkaline solution, to neutralize any acids present, and dried with alcohol and the hot-air blast. This mixture is of marked benefit also in reducing the pain in fitting bands and in removing deep-seated calcareous deposits from roots in the treatment of pyorrhea.—*Era.*

FIRES.—R. S. Cole, Rockingham, N. C., Oct. 20, loss $300.—J. W. Graves, Rochester, N. Y., Nov. 12, loss $50.—W. C. Griffith, Johnstown, Pa., Oct. 31, loss $800, partially insured.—C. D. Henry, New York, Nov. 11, loss $300.—H. J. Hensee, Redwood Falls, Minn., Oct. 22, loss $1,500, no insurance.—H. E. Hosley, Springfield, Mass., Oct. 30, slight loss.—Hudson & Barden,

Springfield, Mass., Oct. 30, slight loss.—M. Kohter, Johnstown, Pa., Oct. 31, loss $2,500.—Kennison & Whittaker, Aberdeen, Wash., Oct. 28, total loss.—J. D. King, Olathe, Kan., Nov. 14, total loss.—D. E. Lane, Aberdeen, Wash., Oct. 16, total loss.—J. D. Miller, Williamsfield, Ill., Oct. 31, total loss.—P. T. Moffet, Bloomdale, O., Oct. 29, total loss.—Northwestern University Dental School, Chicago, Nov. 20, loss $35,000.—I. H. Pomeroy, Gloucester, Mass., Nov. 12, slight loss, fully insured.—J. W. & D. C. Shaw, Springfield, Mass., Oct. 30, loss $1,000, fully insured.—S. F. Tremain, Rome, N. Y., Oct. 20, loss $50.—W. O. West, New Orleans, Nov. 16, loss $100.—E. A. Witmer, Adel, Ia., Oct. 20, loss $450, fully insured.

Removing Cemented-in Crown-pins by Chemical Means.—T. L. Pepperling, St. Louis, in *Era*. The author recommends the following method for removing crown-pins which have been firmly cemented into a root, without enlarging the root-canals and without any danger of cutting through the side of the root, as may happen when removing the cement with a bur.

Apply the rubber dam to the root, using a piece large enough to well cover the nose, so as to prevent the patient's inhaling the irritating fumes. Wrap a wisp of cotton about a broach, saturate it with ammonia water, and apply it to the cement. As soon as the cement becomes soft, remove it with a sharp-pointed instrument. An old stiff broach or a root-canal explorer has been found very useful for this purpose. The operation of dissolving the cement should be continued and all softened particles removed until the pin is well exposed, when it should be extracted with a pair of pliers. The length of the operation depends upon the solubility of the cement in ammonia water, usually from one to two hours' time being required.

Parasite from Dog.—The *Lancet* contains an illustrated article describing a remarkable case treated by Mr. J. Dencer Whittles. The patient, a young woman, 19 years of age, and of robust appearance, was sent to the General Hospital after being treated at the Dental Hospital for thickening of the gums, which was causing considerable protrusion of the upper lip and consequent facial deformity. On questioning the patient, Mr. Whittles learnt that she was fond of dumb animals, and had been in the habit of fondling and kissing a dog which had died recently. Upon further examination he came to the conclusion that the cause of the trouble was a nematode or parasite, and that it had its source from the dog—a Pomeranian crossed with a skye terrier. Mr. Whittles concludes: "So far as I can learn this case is unique, and is of itself a sufficient warning that all should abstain from kissing members of the carnivora—a habit which, both with dogs and cats, is, alas, too frequently indulged in by the tender sex." It seems, however, that a case of a similar character is reported by the *British Medical Journal* from Bombay.

Erroneous Localization of Pain in Dental Disorders.—(*Schweiz. Viertelj. fur Zahnh.-Cosmos.*) Dr. J. Ferrier describes the case of a young man who for a year had suffered from intermittent pain on the left side of the face. The source of the pain was located, according to the patient's opinion, in a large carious cavity upon the masticating surface of the lower left

second molar. He had consulted several physicians and dentists, but without obtaining any relief. Lastly he called upon the writer, to whom the case presented an unusual degree of interest, inasmuch as the competent practitioners whom the patient had consulted had failed to relieve him. He therefore studied the case carefully, and was able to locate the true source of the pain as the upper second bicuspid. The patient complained that whenever any warm liquid was taken into the mouth it produced intense pain. Dr. Ferrier upon examination found that the pulp-chamber was largely open, and that the radicular portions of the pulp were alive, and for this reason he came to the conclusion that warm water could not produce pain in that tooth, for, as is well known, warm liquids bring about pain only when the pulp is undergoing decomposition, by the pressure upon the adjacent nerve filaments due to the gases evolved in rapid fermentation. The upper second bicuspid presented a bluish spot upon the anterior border of the masticating surface; this proved to be a very deep cavity, and was immediately treated. The patient at once began to improve. Incidentally, the reporter calls attention to the erroneous localization of pain in the bicuspids or cuspids, due to disturbances in third molars.

ACCIDENTS.—Two dentists at Coshocton, O., narrowly escaped being asphyxiated by illuminating gas Nov. 14.—R. S. Connor, a dentist of Zanesville, O., was accidentally shot by his companion while out hunting Nov. 12, and will lose the sight of one eye.—A young woman at Binghamton, N. Y., was recently the victim of a peculiar accident. After treating an aching tooth her dentist told her to rub a little chloroform on the gum if the tooth ached during the night. She put the bottle of chloroform under her pillow, the cork came out, and it took a physician several hours the next day to revive her from the resultant stupor.—Oct. 27 a vulcanizer exploded in the office of a dentist at Manchester, N. H. One piece struck a patient on the hand and another piece broke a water pipe, and a store below was flooded before the water could be turned off.—Nov. 10 a dentist at Ashland, Ky., was badly burned by the breaking of a bottle of carbolic acid and may lose the sight of one eye.—A woman in Indiana is dangerously sick from blood-poisoning caused by the extraction of teeth with dirty instruments. For some days her life was despaired of.—C. P. Hebert, a dentist at Riverside, Cal., while riding horseback was struck in the eye by the limb of a tree, and it is feared that he will lose his sight.—C. E. Coleman, a dentist at Fort Gaines, Ga., fell down-stairs Nov. 6 and was badly injured.—A dentist at Hanover, Pa., was badly burned last month while manufacturing nitrous oxid gas.—A woman in Denver, Colo., had suffered severely for years from neuralgia of the face, and several operations had failed to relieve it. Her dentist advised that the infraorbital nerve be removed, and he performed the operation before the students of the dental college in that city. It was a complete success, but the woman almost died from the effects of the anesthetic.

ILLEGAL PRACTITIONERS.—Last month we stated that the California Board had arrested several dentists at Oakland, claiming violation of the state law, and they on the other hand claimed they were fully complying with the law.

Nov. 3 the agent of the board appeared in court and asked to have the cases dismissed, stating that a mistake had been made. Oct. 17 a man at Sanger was arrested for practising without a license.—Nov. 20 the grand jury in session at Louisville indicted five dentists for failure to comply with the law.—Oct. 29 a man at Goodland, Minn., was fined $50 and costs for practising dentistry without a license.—Nov. 3 the dentists of Kansas City, Mo., met to formulate plans to stop the illegal practice of dentistry in that city. It is asserted that there are more than fifty dentists there who have no license, and it is further claimed that a large number of dental students are doing work "on the side."—Oct. 21 three dentists at Omaha were arrested for illegal practice.—The New York State Dental Society was unsuccessful in its endeavor to have the October grand jury find indictments against illegal practitioners. One man in particular has been in court several times for practising without a license, but on each occasion a jury of his friends refused to find him guilty.—Last month we stated that a man of Hendersonville, N. C., had sued the state board for $5,000 damages, and had applied for a writ of mandamus to force the board to give him a license, he having failed to pass the recent examination. Nov. 12 the court refused his demand and dismissed the case.—Nov. 10 a man at Spokane, Wash., was arrested for practising dentistry illegally. The dentists in Seattle and Spokane who were arrested last month for practising without a license have pleaded guilty and will take the matter to the supreme court and test the constitutionality of the law.

Don'ts on the Use of "Hot Air."—Read before the Toronto Dental Society, May, 1903. (*Dominion.*)—Don't remark at dental conventions or elsewhere that you never charge less than $15.00 for a gold crown, nor less than $10.00 for a gold filling. Young practitioners might believe it, while older practitioners might persuade you that Toronto is too small for such a genius.

Don't attribute unworthy motives to another practitioner because he joins some sociey, or because he attends church. The man who emits this variety of "hot air" usually spends Sunday at the operating chair. He finds it pays better.

Don't think you are too busy to attend dental meetings. The men who accomplish most and are really the busiest men are seldom heard to remark, "I am too busy."

Don't talk shop. If you talk about your work when you are out of your office, wise ones will know that you do not get enough work when you are in your office.

Don't try to impress people with the magnitude of your practice by remarking that you have appointments extending over the two following months. It may be that the man at the next corner does just as much work, and yet, because of greater executive ability, has his appointments only two weeks in advance. This latter course will be found more satisfactory to both dentist and patient.

Don't criticise adversely every piece of work you see. You might inadvertently happen on a piece of your own and have difficulty in making explanations.

Don't forget it takes a "rubber" bulb to force the hot air. If you are in the habit of dealing in this commodity don't look surprised if some fellow says "rubber." The market value of a hot air syringe is such that every dentist can afford to have one, *and always use the syringe.*

MARRIAGES.—J. L. Bigham, a dentist of New York, was married to Miss Ethel Griffin of White Plains, N. Y., Aug. 11.—John Burton, a dentist at Rockville, Ind., was married to Miss Elizabeth Dorley of Rockville, Oct. 29.—George S. Corne, a dentist of Circleville, O., was married to Miss Anna Boecher of Hallsville, Nov. 5.—M. Crawford, a dentist of Chicago, was married to Mrs. Elnora Rounds of Oshkosh, Wis., Nov. 17.—C. Dickson, a dentist at Jackson, Ky., was married to Miss Grace Adams of Clay City, Ky., Nov. 18.—Mary T. A. Foster, a dentist at La Crosse, Wis., was married to Ernest Desemone of Nashville, Tenn., Nov. 5.—W. H. Green, a dentist at Lebanon, Ind., was married to Miss Nina Liebhardt of Zionsville, Ind., Nov. 17.—B. F. Henchey, a dentist at Torrington, Conn., was married Oct. 27.—Walter Hartshorn, a dentist at Toledo, was married to Miss Lottie Johnson of Newark, O., Oct. 28.—H. L. Henry, a dentist at Ashland, Neb., was married Nov. 18.—F. B. Holcomb, a dentist at Cherry Creek, N. Y., was married to Miss Blanche M. Curtiss of Cherry Creek, Nov. 11.—D. H. Ingalls, a dentist at Boulder, Colo., was married to Miss Georgia Harvey of Boulder, Oct. 28.—James Keerans, a dentist at Charlotte, N. C., was married to Miss Sarah L. Wolfe of Charlotte, Nov. 11.—J. A. Lockwood, a dentist at Filmore, N. Y., was married to Miss Alice Austin of Newark, N. Y., Oct. 28.—W. E. Lyons, a dentist at Chicago, was married to Miss Estella R. Standish of Irving Park, Oct. 26.—Cortland Major, a dentist at Fenton, Mich., was married to Miss Lottie Taylor of Fenton, Oct. 27.—John J. F. McLaughlin, a dentist at North Adams, Mass., was married to Miss Margaret E. Rowan of New York, Sept. 21.—Percy Nixon, a dentist at Birmingham, Ala., was married to Miss Lottie Pearson of Opelika, Ala., Nov. 5.—G. T. Richards, a dentist at Argyle, Wis., was married to Miss Grace Mann of Richland Center, Wis., Oct. 26.—John Schleiter, a dentist at La Crosse, Wis., was married to Miss Melinda Koenig of La Crosse, Oct. 21.—R. D. Thomas, a dentist at Walworth, Wis., was married to Miss Emma Crosby of Beloit, Wis., Oct. 27.—W. T. Triplett, a dentist at Mendon, Ill., was married to Miss Emma Fletcher of Mendon, Oct. 28.—C. F. Vasey, a dentist of Salineville, O., was married to Miss Bella D. Crosser of Salineville, Oct. 28.—Thomas Wall, a dentist at Sulphur, I. T., was married Oct. 21.—A. E. Wood, a dentist at Checotah, I. T., was married to Miss Irene Lipscomb of Kansas City, Nov. 11.—D. S. O. Wood, a dentist of Weston, O., was married to Miss Lucy Rethinger of Custar, O., Nov. 19.

AT THE DENTIST'S.

"For the readers of the DIGEST, with apologies to Edgar Allen Poe, and no disrespect to the profession." *Sarah Van Buskirk,* Monticello, Ind.

Hear the buzzing of the drill—
Rasping drill!
What a world of torture in my jaw it doth instill!

In this molar void and aching,
Wretched havoc it is making.
I am gagged; I cannot speak,
I can only shriek, shriek, shriek,
In a clamorous appealing to the mercy of the dentist,
In a mad expostulation with the fierce, malicious dentist,
Digging harder, harder, harder,
With a savage fiendish ardor,
And a resolute endeavor
Now to slay me, now or never.
Oh, the drill, drill, drill!
How it files and scrapes and grates!
How it grinds and triturates!
In the whirring and the burring
Does my anguish sink and swell,
In the crushing and the cutting of the drill,
Of the drill,
Of the drill, drill, drill, drill,
Drill, drill, drill—
In the punching and the crunching of the drill!

Hear the humming of the drill,
Wicked drill!
What a world of agony its clatterings foretell!
Through my blood a chill 'tis sending
With its sing-song never ending.
In the harness, bit and rubber,
I can only slobber, slobber.
And to make things more like Hades, through the window I can see
The devil on the court house leering viciously at me.
While the drill is gritting, gritting,
And my frantic nerves are splitting.
My defenceless flesh is crawling
'Neath the friction hot and galling.
Oh, the drill, drill, drill!
How it scratches, pounds and thumps!
How it spins and bores and bumps!
Keeping time, time, time,
In a sort of Runic rhyme
To the rapping and the tapping of the drill,
Of the drill
Of the drill, drill, drill, drill,
Drill, drill, drill—
To the ramming and the cramming of the drill!

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